

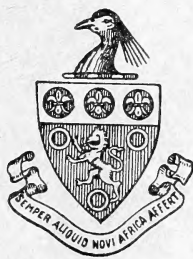


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ANNALS
OF THE
SOUTH AFRICAN MUSEUM
VOLUME XXXIX.

The Crane-flies of the South-West Cape (Diptera, Tipuloidea).
By H. G. WOOD, B.A., Ph.D. (With 105 Text-figures.)



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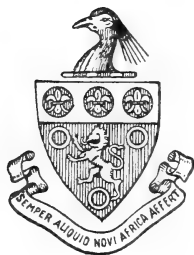
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VOLUME XXXIX.

The Crane-flies of the South-West Cape (Diptera, Tipuloidea).

By H. G. WOOD, B.A., Ph.D.

(With 105 Text-figures.)

THIS paper forms a survey of the Crane-flies of the south-west Cape region. The territorial limits of this region are arbitrary ones and became fixed chiefly by the transport facilities and by the short periods of the year available for the systematic collection of specimens. The area of this investigation comprises the coastal belt of the Cape Province from Port Elizabeth ($25\frac{1}{2}^{\circ}$ E.) to Clanwilliam ($32\frac{1}{4}^{\circ}$ S.).

The principal objects of this paper are to supplement the original descriptions by Alexander (1917, 1921) with figures and notes, and to record the life-histories of numerous species bred from material collected during the years 1932 to 1939 by Dr. K. H. Barnard, Mr. C. W. Thorne and the author. I am indebted to the Director of the South African Museum for the use of the literature and for permission to examine the holotypes in the South African Museum, which were described by Alexander (1917, 1921). Especially do I tender my thanks to Dr. K. H. Barnard for his suggestions, generous help, companionship and collecting in the field, both of the adults and immature stages of Crane-flies. I have also to thank Mr. C. W. Thorne for his assistance and co-operation in field work and for his patience and enthusiasm in breeding the majority of the immature stages—factors which have made this paper possible. I am also

indebted to Mrs. Wood for her enthusiasm in collecting and for the discovery of several new larvae and pupae.

TOPOGRAPHY

Portions of a concise and excellent description of the region by Barnard (1943) read as follows:—

“Of the rivers in this area the Berg and the Olifants (Clanwilliam) rivers run approximately north-westwards to the Atlantic Ocean; the others flow southwards and south-eastwards, arising on the south side of the main Cape watershed.

“The main Cape watershed runs from about Tulbagh north-eastwards to Matjiesfontein and along the line of the Klein Roggeveld, Komsberg, Nieuwveld and Sneeuwberg ranges. North of this line, and east of the Roggeveld escarpment, lie the catchment areas of the southern tributaries of the Orange River. The formation of this watershed . . . is considered to have occurred or to have been intensified during Tertiary times. From Tulbagh a continuous chain of mountains strikes southwards and south-south-westwards to Cape Hangklip. The fish fauna, and also the distribution of certain insects, indicates that these mountains have been a barrier of some importance.”

“In the northern part of the Cape Peninsula only the rivers arising on the eastern and southern slopes of Table Mountain, Constantia Berg and the Kalk Bay Mts. contain fishes. Of these the Black River (with its tributaries the Liesbeek and Kromboom streams) flows northwards into Table Bay; the Palmiet River flows southwards into Hout Bay on the Atlantic coast; the Diep River and Silvermine River drain southwards into False Bay.”

“There are several lakes (vleis) on the Cape Flats (isthmus) which are more or less interconnected, at least during periods of heavy rainfall. The poverty of the fish fauna . . . of the streams of the Cape Peninsula and the adjacent (western) portions of the Cape Flats is evidently due to the whole isthmus between Table Bay and False Bay having been formerly under the sea.”

It is interesting to note that this area has been a barrier to the dispersal of numerous Tipulidae from Table Mountain to the mainland and *vice versa*.

Table Mountain (3549 feet) is the dominant mountain mass of the Cape Peninsula and provides ample material for the collector of Crane-flies. Every type of ecological habitat occurring in the rest

of the S.W. Cape is duplicated on Table Mountain (see Table: Ecological Habitat, p. 5).

The vegetation of this S.W. Cape region is characterised by the development of the Rutaceae, Proteaceae, Ericaceae and Restiaceae with a consequent similar composition occurring in the plains as on the highest mountains (7381 feet Matroosberg). In the greater portion trees are confined to the ravines of the mountain ranges, but towards the east in the districts of Knysna and Tsitsikama magnificent forests of indigenous trees exist. As the immature stages of Crane-flies are notable lovers of moisture, living in an aquatic or subaquatic habitat, investigation and collecting have been concentrated on those districts yielding a high degree of shade and humidity.

Seventy-six species are now known to occur in the S.W. Cape, of which seventeen are new. Prior to this paper no life-histories of Tipulidae had been described from South Africa; forty-four correlated life-histories are herein described from the S.W. Cape. This in terms of genera means that only seven out of twenty-three representative life-histories are still to be discovered.

ECONOMICS AND GENERAL STRUCTURE

No attempt is made in this paper to duplicate the information pertaining to Crane-flies, for future workers could not do better than to refer to Alexander's "Crane-flies of New York" (1920 *a*), which supplies a wealth of detail necessary for the study of the family and which contains a tabulation of references published by various authors prior to 1920. Pages 845–876 refer especially to details of general structure of imagoes; pages 837–845 to the life-cycle of typical examples of Tipulidae.

WING VENATION

The nomenclature for wing venation in this paper is the Comstock-Needham system as modified by Tillyard and Alexander. The system of Comstock (1918) for the medial and cubital fields of the wing was altered by Tillyard (1919, 1926). Since then Alexander (1927 *a*, pp. 169–171; 1927 *b*, pp. 42–71) has demonstrated fully that certain modifications of the radial field were necessary, due to the fact that two distinct lines of specialisation have appeared in the Tipulidae. For the purposes of quick reference the following is a summary of his interpretations of the radial field, which are applicable to S.W. Cape species.

(1) The tribes Hexatomini and Eriopterini have evolved from some ancestor similar to the present genus *Peringueyomyia*. From this primitive type of venation (fig., Alex. 1921, p. 233) the anterior branch of the upper fork of RS, *i.e.* the vein R_2 , has swung cephalad and fused with vein R_1 . A consequent element R_{1+2} has been formed (figs. 61a, 69a, 97a).

(2) Simultaneously, the anterior branch of the lower fork of RS, *i.e.* the vein R_4 , has become attached to the stem (R_{2+3}) of the upper fork; thus an element R_{2+3+4} has been formed (figs. 61a, 69a, 97a).

(3) The posterior branch of RS is thus R_5 alone (figs. 61a, 69a).

(4) In some higher forms (fig. 80a) vein R_3 and R_4 may become fused as far as the wing margin, thus eliminating cell R_3 .

(5) In the subfamily Tipulinae and in the tribe Limoniini (see notes on systematics) a true radial cross-vein (r) occurs but is present in an oblique or longitudinal position, forming part of a serial vein consisting of $R_1 + r + R_2$ (figs. 59a, 60a).

(6) The distal portions of R_1 and R_2 have atrophied (figs. 55b, 57a).

(7) The posterior branch of RS is the resultant fusion of R_4 with R_5 as far as the wing margin (figs. 55a, b, 57a).

The figures of wings in this paper are projections by the author.

GENITALIA

The early workers on Crane-flies laid stress chiefly on the wing venation and on the colour of the species described, but of recent years there has been a growing tendency to figure the male hypopygium in addition. This is a satisfactory state of affairs, as the male hypopygium is of vast importance in differentiating closely allied species. It is understandable that some authorities are not prepared to permit the "mutilation" or dissection of types in their collections, but is it of greater scientific value for a species to be fully described and figured than for it to be pinned in solitary remoteness in a cabinet?

The genitalia of dried specimens may be satisfactorily examined after soaking the end of the abdomen (*i.e.* from the seventh segment) in 30 per cent. alcohol for four to ten days (depending on the age of the specimen). This allows the tissues to soften and to recover a fair amount of their original shape and elasticity. The genitalia can then be cleared in a 10 per cent. solution of KOH for one to four days (depending on the amount of chitinisation), examined "in the round" under alcohol and fixed for future reference as a permanent mount.

Parachlorophenol + chloralhydrate may be used as an alternative clearing solution to KOH.

The "wet" method of collecting Tipulidae, *i.e.* in 40–50 per cent. alcohol + 6–8 drops of glycerine, is thus advantageous as it preserves the body structures from shrinkage and permits easier handling, examination and dissection. Specimens required for the cabinet are readily dried and pinned. The legs tend to break at the end of the femur whatever the method of collection and are thus of little value from a morphological standpoint.

Full descriptions of the composition of Tipulid genitalia will be found under the various notes on generic characteristics.

ECOLOGICAL HABITAT

The works of Alexander (1920 *a*), Bangarter (1928–1930) and Rogers (1926–1933) have added considerably to the knowledge of the environment in which the immature stages of Crane-flies occur. Inexact and generalised statements of their habitat found in early publications have given way to an accurate tabulation, for it will be seen (*infra*) that the majority of Crane-flies, as larvae, require moisture to a varying degree. Rogers (1930) gives a graphic illustration of this fact: "among the crane-flies swept from the herbage of the stream-margined thickets, some of the species exist as larvae in the coarse damp sand; others in small pockets of saturated silt by the rill margin; another lives attached to stones beneath the flowing water; others in mosses and liverworts; others in drier mosses; some in waterlogged, rotten wood; and still others in fungi or comparatively dry rotten wood. For some of these species the actual habitat is the wet rotten wood, the fungi or the flowing brook, and these may be provided by a variety of general habitats that differ markedly in topography and vegetational association from the stream-margined thickets".

The following ecological habitats of the S.W. Cape larvae are arranged on the lines suggested by Alexander (1931, pp. 137–148), but this tabulation may require a more exact limitation in future years.

- A. On vertical cliff and rock faces, in or beneath a scum of algal growth with percolating or flowing water; in rapid-flowing streams under hygroscopic conditions.

Limonia tipulipes (Karsch).

Limonia capicola (Alex.).

- B. In slime tubes in or attached to filaments of moss growing on cliff and rock faces with percolating or flowing water.
Limonia sexocellata (Alex.).
Limonia rubrithorax (Alex.).
- C. In or beneath wet to saturated mats or cushions of mosses and liverworts, on earth or rocks along stream margins.
Dolichopeza hirtipennis Alex.
Dolichopeza flavifrons Alex.
Elephantomyia aurantiaca Alex.
- D. In or beneath wet to saturated mats of *Juncus* lying partially in water along stream margins.
Tipula jocosa Alex.
- E. Sandy, gravelly or loamy soil, with slight humus, at margins of streams or ponds.
Peringueyomyia barnardi Alex.
Tipula pomposa Bergroth.
Limnophila dubiosa Alex.
Limnophila crepusculum sp.n.
Gonomyia nigrobimbo Alex.
Gonomyia sulphurelloides Alex.
Erioptera claripennis Alex.
Erioptera witzenbergi sp.n.
Trimicra inconspicua (Loew).
- F. Rich organic earth or mud, as at margins of rills, streams, vleis or other water-bodies, or on small rocks, ledges; in swamps and marshes; in leaf drift at stream margins.
Tipula soror Wiedemann.
Limnophila nox Alex.
Conosia irrorata (Wiedemann).
Rhabdomastix afra sp.n.
- G. Beneath leaf mould, in rich moist to saturated humus soil in woods.
Tipula caffra Alex.
Goniotipula cuneipennis Alex.
Nephrotoma antennata (Wiedemann).
Nephrotoma petiolata (Macquart).

Nephrotoma umbripennis Alex.

Longurio capicola Alex.

Longurio chionoides (Alex.).

Longurio minusculus Alex.

Longurio silvester sp.n.

H. In tree boles in forests, containing damp rotting humus.

Limonia subapicalis (Alex.).

I. In wet to saturated decaying wood, adjacent to streams or in forest areas, in a rust-coloured slimy scum just beneath the dead bark.

Limonia subapicalis (Alex.).

Elephantomyia montana Alex.

J. In wet to saturated decaying wood adjacent to streams or in forest areas, but tunnelling in the wood itself.

Limonia peringueyi (Alex.).

K. In wet to saturated decaying or rotten wood, confined to immediate vicinity of stream, mostly in or projecting from the water.

Limnophilomyia lacteitarsus Alex.

Pseudolimnophila medialis (Alex.).

Pseudolimnophila griseiceps (Alex.).

Pseudolimnophila thornei sp.n.

L. In relatively dry soil beneath *Restio* clumps or in soil under the lee of rocks on mountain plateaus.

Tipula coronata Alex.

Tipula caffra Alex.

Longurio belloides Alex.

Longurio bonae spei (Bergroth).

Longurio micropteryx Alex.

Longurio minusculoides sp.n.

Longurio dolichoros sp.n.

Longurio flagellata sp.n.

Nephrotoma antennata (Wiedemann).

M. Beneath carpet of moss on relatively dry soil on mountain summits.

Longurio spinosa sp.n.

TAXONOMY

In South Africa three families of Crane-flies have been recorded, namely Tanyderidae, Ptychopteridae and Tipulidae.

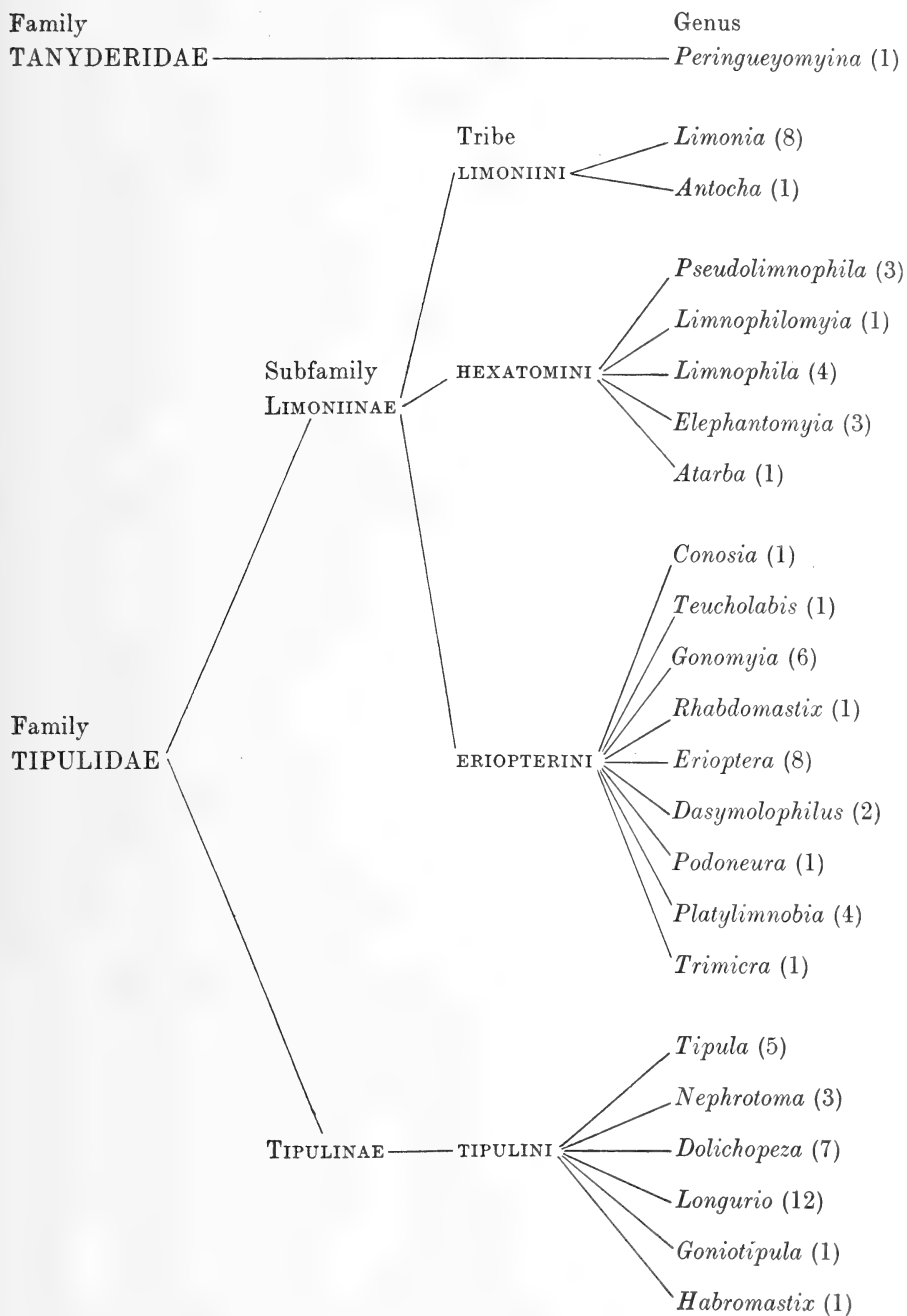
In the S.W. Cape region the primitive family Tanyderidae is represented by a remarkable genus *Peringueyomyia* Alex., but no member of the family Ptychopteridae has as yet been discovered. The majority of species belong to the family Tipulidae, the actual distribution into smaller groups being shown to the best advantage by the following chart. (The figure in parenthesis indicates the number of species composing the genus).

In this paper subgenera have been dispensed with as far as it is possible at present. Subgenera, however useful they may seem from a classificatory point of view, are artificial and ephemeral, existing in keys only until some connecting link or characteristic is discovered. In nature, subgenera or even genera do not exist—they are founded for classificatory purposes upon arbitrary characteristics instituted by some author, often upon the observation of a solitary specimen. Too much attention is given by some scientists to the naming of single specimens, which exist in collections and which are isolated from the natural environment, divorced from their genetically different brothers and sisters, and are uncorrelated with their immature stages.

The rearing of the immature stages of Crane-flies during recent years has improved the taxonomy of Tipulidae to a marked degree; it has shown the close alliance of genera and revealed the gradual transition of the specialised and complex members of one tribe to the primitive forms of another—a state of affairs which was not considered possible by early authors when observing and describing only the adult fly. (Cf. notes on genus *Limonia* in this paper, p. 168).

BIBLIOGRAPHY AND LOCALITIES

In order to avoid duplication of the references cited and of collecting localities, full lists are given at the end of this paper (pp. 322–325).



MICROPTERISM: see genus *Longurio* (p. 106).

Key to Families in S.W. Cape.

Imagos.

1. Only one anal vein reaches wing margin (fig., Alexander, 1921,
p. 233) *Tanyderidae.*
- Two anal veins reach wing margin (fig. 28, c) *Tipulidae.*

Larvae.

1. Body eucephalous, head non-retractile; no spiracular disc or
spiracles at end of abdomen; replaced by six conspicuous
filaments *Tanyderidae.*
- Head retractile; spiracular disc usually present; if absent,
spiracles occur at the end of abdomen *Tipulidae.*

Pupae.

1. Wing pads reveal *Peringueyomyina* venation *Tanyderidae.*
- Wing pads not as above *Tipulidae.*

FAMILY TANYDERIDAE.

1880. Osten-Sacken, p. 517 (subfam. TANYDERINA).

1921. Alexander, p. 231.

One genus and one species occurs in the S.W. Cape.

Gen. PERINGUEYOMYINA Alex.

1921. Alexander, p. 232.

Peringueyomyina barnardi Alex.

Figs. 1-3.

1921. Alexander, pp. 233-234, fig. (wing).

Imago.—See Alexander, pp. 232-234.

Larva.—Body eucephalous, terete, segments devoid of creeping
welts; chaetotaxy prominent; lateral spiracles on prothorax and

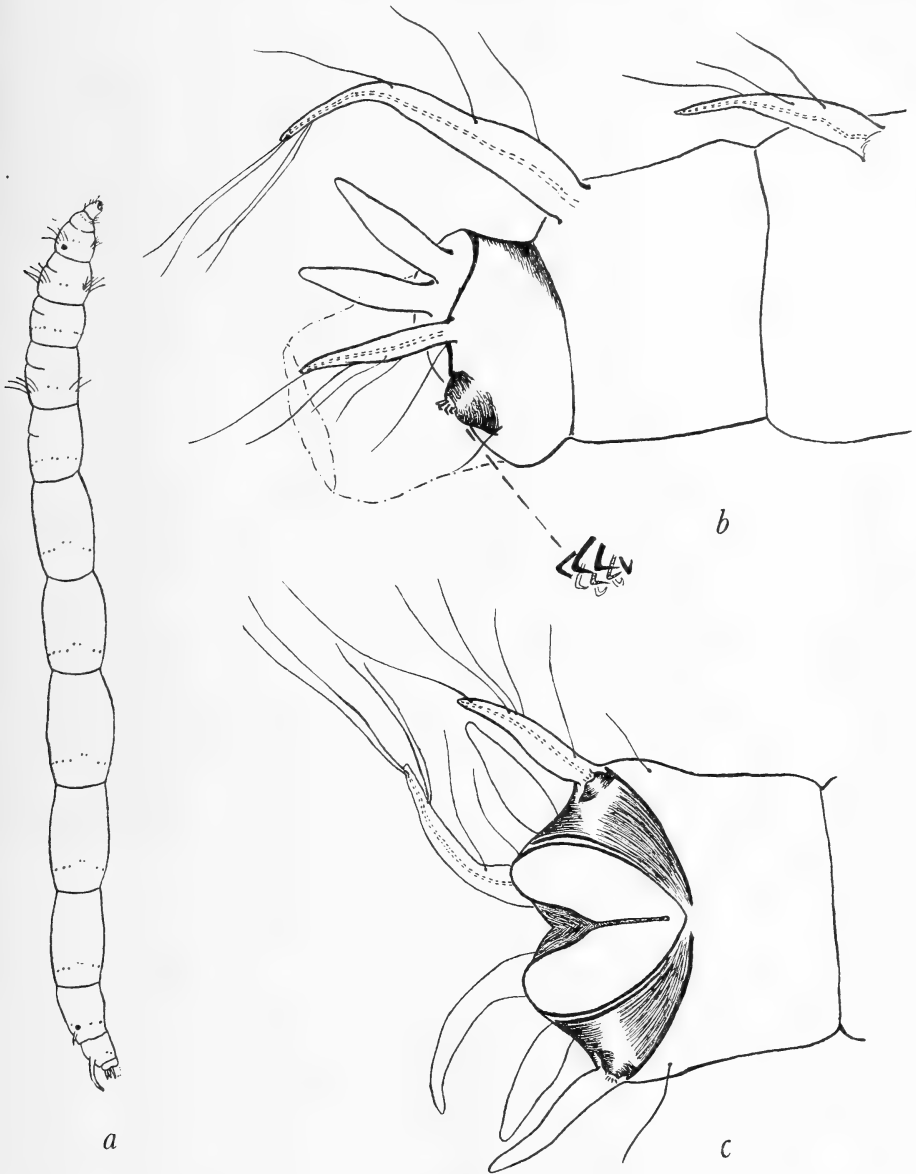


FIG. 1.—*Peringueyomyia barnardi* Alex. *a*, lateral view; *b*, lateral view of end of abdomen, dotted lines show protuberant anus; *c*, ventral view of abdomen.

eighth segment of the abdomen; no spiracular disc; end of abdomen with six conspicuous filaments or tracheal gills and two pairs of large elongate anal gills. Details of head capsule as in general description.

Pupa.—No cephalic crest; breathing horns small, widening to a funnel shape; leg sheaths unequal in length, the fore tarsi the shortest; venation on wing pads typically *Peringueyomyin*; abdominal segment eight with fingerlike lobes, the other segments having a transverse row of spines near the posterior margin; cauda prominent, as in general description.

Alexander's description of the adult fly is excellent.

Larva.—Length 25–26 mm., diameter 1.8–2 mm. Colour dirty white, posterior segments often greyish black due to the contents of alimentary system, head capsule dark brown.

Body (fig. 1, *a*) eucephalous, terete, creeping welts absent; prothorax divided by a constriction into two complete rings, slightly larger than the meso- and metathorax which are divided dorsally into two portions; the nine abdominal segments gradually increase in length to the seventh segment which is almost twice as long as broad, the eighth and ninth segments decrease rapidly in length; the first and second abdominal segments are divided dorsally into a narrow basal ring and a broader posterior ring, the division on the remaining segments less distinct; eighth abdominal segment with a pair of dorso-lateral fleshy filaments near posterior margin, each filament bearing three to four elongate setae; ninth segment with a pair of similarly situated filaments, twice as long as the former pair, bent sharply at mid-length, tapering to slender apices, carrying three elongate single setae and two pairs of apical setae; ultimate segment ringlike, having on each outer lateral margin a fleshy filament with five elongate single setae, this filament about equal in length to that on the eighth abdominal segment, dorsad to each filament a pair of anal gills, narrow at origin, then dilated somewhat and tapering to rounded apices, ventrad to each filament a protuberance, the apex of which has numerous minute hooks. In each filament there appears to be a tracheal tube, the filaments probably serving as tracheal gills and helping the minute spiracles situated on the prothorax and eighth abdominal segment. Anus often protruding; no spiracular disc.

Chaetotaxy prominent: head with eight dorsal setae, four along each side of clypeus, three lateral setae, and two ventral setae. Basal ring of prothorax with row of six dorsal setae, four pleural setae and row of four ventral setae behind origin of head capsule; posterior

ring with row of eight dorsal setae, two pleural setae, seven scattered ventral setae and two tufts of four setae. Basal ring of meso- and metathorax bare; posterior ring as in prothorax. Abdominal segments 1-7 with basal and the posterior rings having row of eight dorsal setae, two pleural setae and row of four ventral setae. Abdominal segment eight with one seta cephalad of filament and row of four ventral setae. Abdominal segment nine with two ventral setae.

The chaetotaxy from abdominal segment three becomes more delicate and more difficult to detect owing to the contents of the alimentary system forming a dark background.

Head capsule (fig. 2, *a*) massive, compact, heavily chitinated. Clypeus elongate-triangular, apex of triangle posterior, anterior lateral corners with a pair of stout setae. Antenna (fig. 2, *b*) inconspicuous even under high magnification, broader than long, with a single seta and two apical papillae almost as long as the antenna; ventrad of these are concealed six minute papillae. Mandible (fig. 2, *c*) broad, massive, with three strong apical teeth, inner face of mandible bearing a prosthecal tuft of numerous slender truncate setae and delicate hairs, caudad of this tuft a single seta, near the heel of mandible a pair of stout prominent spines. Maxilla (fig. 2, *d*): outer lobe cylindrical with an apical palpus (bearing about six sensory papillae) and a small sensory papilla; inner lobe small, broad, outer angle with short curved slender papilla, anterior margin indented with small papilla and a tuberculate seta, inner anterior and posterior angles with tuft of setae. Labrum (fig. 2, *a*) broad, dorsal surface with two elongate tuberculate setae near posterior margin; outer margin of labrum with strong setae which are continued ventrally on to the epipharyngeal surface to form two dense cushions, in which occur two ridges of short truncate papillae on either side of median line; inner corners of anterior margin with a large truncate papilla and three to four stout, blunt, slightly smaller papillae. Hypopharynx (fig. 2, *e*) a flat plate, on lateral edges of the slightly concave anterior margin is a blunt rounded swelling or tooth, laterad of which is another truncate swelling or tooth; ventral surface covered with numerous scalelike setae. Mentum (fig. 2, *f*) entire, twice as long as broad, anterior margin bearing eight broad blunt teeth, each outer pair slightly smaller than the inner teeth.

Pupa.—Length 14-15 mm., diameter 2 mm. Colour pale yellowish brown, thorax and breathing horns dark brown, cauda chitinated. Chaetotaxy prominent.

No cephalic crest. Immediately dorsad of each antennal origin a tuberculate spine, farther dorsad and slightly laterad two tuberculate

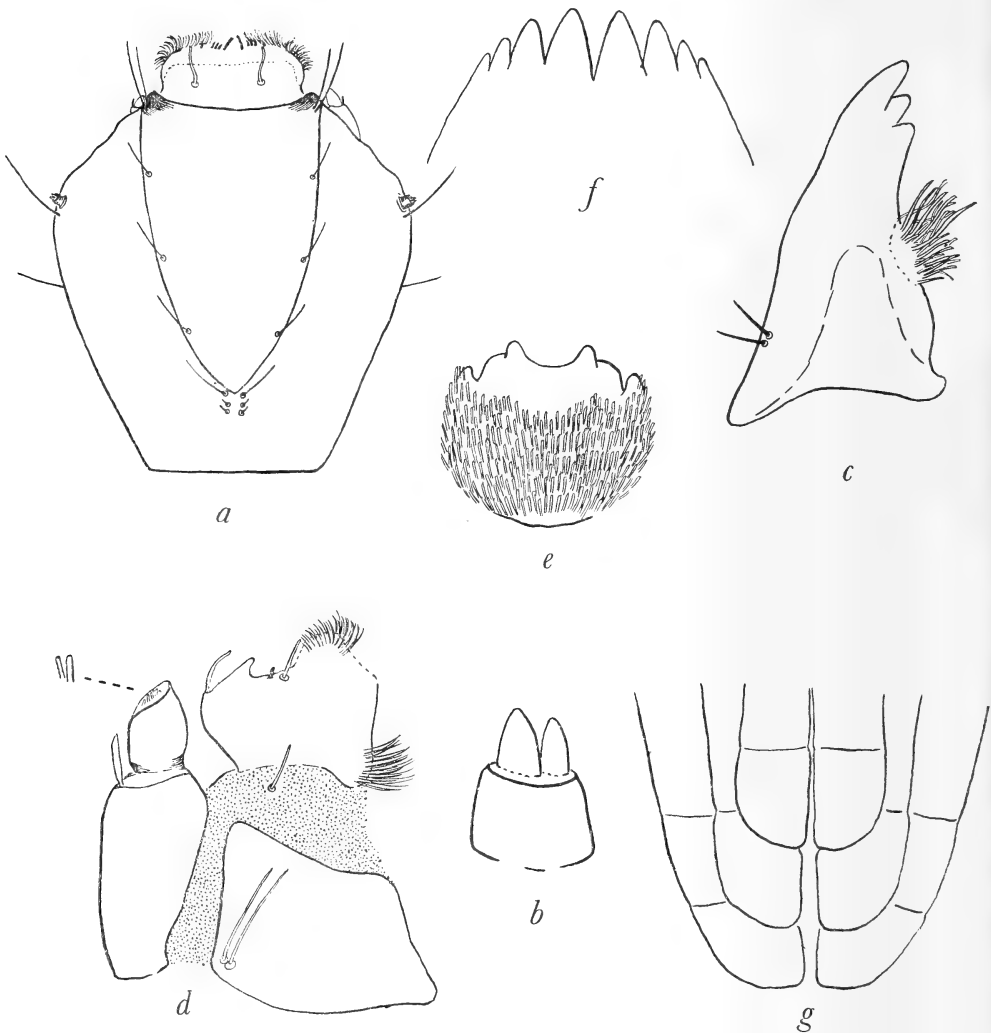


FIG. 2.—*Peringueyomyia barnardi* Alex. Larva: *a*, dorsal view of head capsule; *b*, dorsal view of antenna; *c*, mandible; *d*, maxilla; *e*, ventral view of hypopharynx; *f*, anterior margin of mentum. Pupa: *g*, ends of tarsal sheaths.

setae; a single seta over inner corner of eye and three setae near apex of maxillary palpus. Frons prominent, comprising two medial lobes, each with an anterior spine and a pair of caudal spines. Rostral

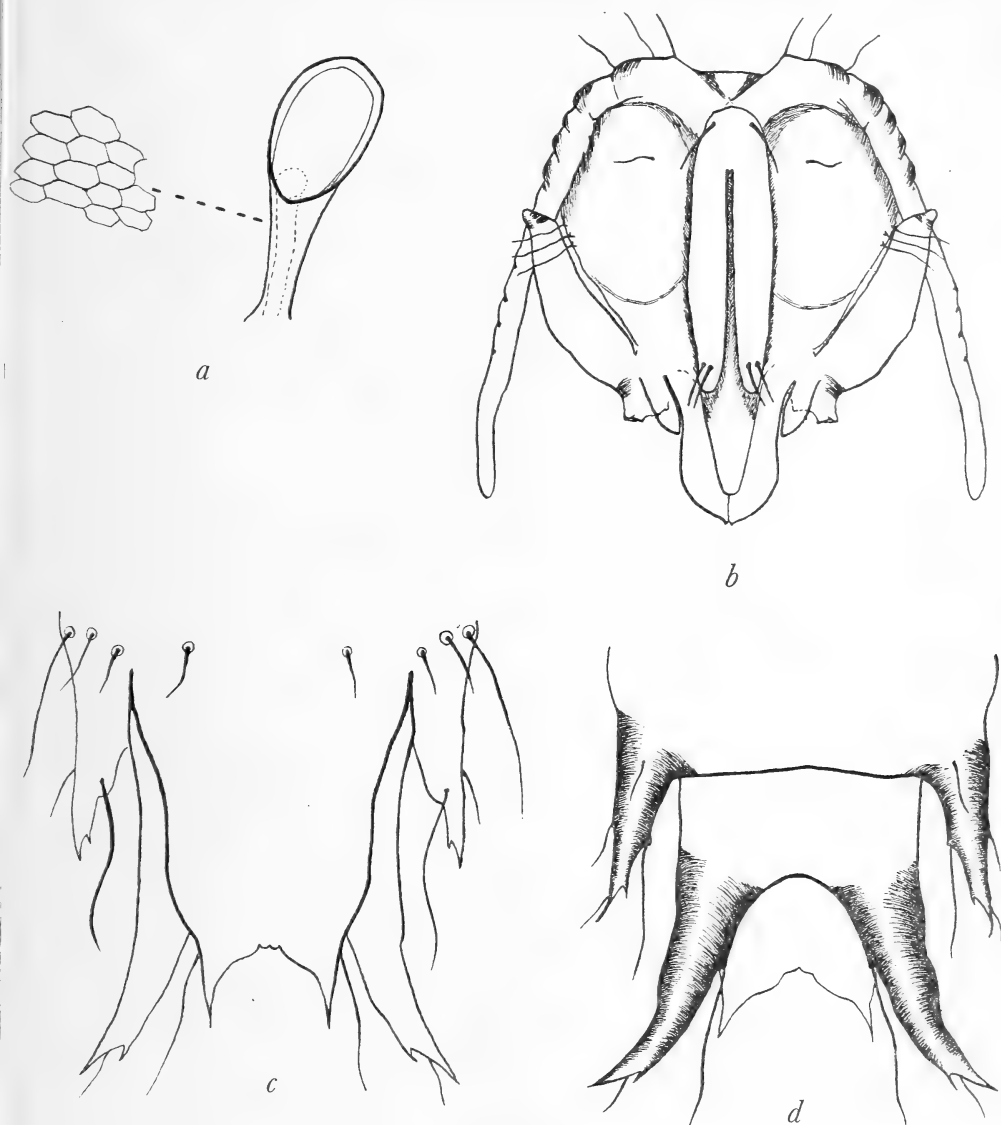


FIG. 3.—Pupa of *Peringueyomyia barnardi* Alex. a, pronotal breathing horn, with further enlargement of surface sculpturing; b, head region (ventral aspect); c, ventral view of cauda; d, dorsal view of cauda.

sheath (fig. 3, *b*) short, a tapering tube, apex truncate; labial lobes longer than broad, margin gently curved towards the apices; maxillary palpi long, abruptly narrowed into small tubelike apices, inner angle of margin strongly angulated. Antennal sheath (fig. 3, *b*) extending to base of wing pad, slender, apex rounded, outer basal margin with five dilations.

Thorax depressed, practically flat. A pair of setae at cephalic origin of wing pad and at base of halteres; a seta at apex of antennal sheath, a tuft of three setae on mesothorax slightly laterad of median line, a row of four setae across metathorax. Pronotal breathing horn (fig. 3, *a*) short, gradually widening to a funnel-shaped apex, surface with elongate-hexagonal sculpturing; adjacent to the breathing horn a large tubercle which has three long setae. Wing pads extend to end of abdominal segment 2; revealing the typical *Peringueyomyin* venation, which makes the correlation of pupal "shucks" with imagos a certainty; sheaths of fore tarsi ending opposite end of abdominal segment 2, other tarsi as in fig. 2, *g*.

Abdominal segments roughened with microscopic hooks and rounded tubercles. Abdominal segment 1 with two setae towards lateral region on tergite and a transverse row of eight setae near posterior margin. Abdominal segment 2 with the transverse row of eight setae and three pleural setae. Tergites and sternites 3-7 with an anterior row of four setae and the transverse row of eight setae near posterior margin, these being more delicate and spinelike than those in the anterior row; three pleural setae, one situated in mid region, the remaining two near posterior margin. Each dorso-lateral corner of abdominal segment 8 prolonged into a fingerlike lobe, inner margin irregular, apex acute, the arrangement of the four elongate setae as in fig. 3, *d*; the sternite with no anterior setae, two ventral setae present near posterior margin, three setae ventrad and one seta dorsad of each dorso-lateral lobe. Cauda of female: tergal sheaths (fig. 3, *d*) fingerlike, larger than sternal sheaths, apex acute, two elongate setae present as in fig. 3, *d*; sternal sheaths (fig. 3, *c*) wide at origin, with slender acute divergent apices; in lateral aspect these sternal sheaths curve slightly dorsad, their apices being hidden by the tergal sheaths. Cauda of male: tergal sheaths as in female; sternal sheaths elongate, bulbous basally for the basistyles of the imago, then abruptly constricted into two slender dorsally curved lobes, tapering to acute apices and longer than the tergal sheaths; in many pupae the dististyles of the male imago can be clearly seen in these sheaths, thus deciding the sex of the pupa prior to the emergence of the adult fly;

at the origin of each sternal sheath is inserted a small wide lobe, acute apically and bearing a small seta.

Localities.—Cape Peninsula: nil.

Cape Province: Oudebosch (K. H. B., C. W. T., H. G. W.), January 1933 and 1934; Landdrost (K. H. B., C. W. T., H. G. W.), January 1933; French Hoek Pass (G. A. W., H. G. W.), April 1935; Palmiet River (G. A. W., H. G. W.), March 1932; Hermitage Kloof (G. A. W., H. G. W.), January 1938.

Remarks.—This fly is apparently limited in its distribution. Dr. Barnard, Mr. Thorne and the author have collected Tipulidae extensively in the S.W. Cape region since 1931, but the above are the only localities in which this Tanyderid occurs.

In January 1932 some fifty adults were collected at Oudebosch. In the same month of the following year, Mr. Thorne and the author spent the best part of two days searching for and ultimately finding three mature pupae and two pupal exuviae. The larvae occurred beneath a large overhanging boulder in the white gravelly sand spits along the edges of a forest streamlet. The difficulties of the search can be realised by few—the days seemed endless as we scratched in the sand, becoming wetter and more miserable by the hour. The pupal exuviae were found in the drier ridges above the water; doubtless the larvae migrate to these regions prior to pupation.

In January 1938 Mrs. Wood and the author found some thirty larvae and pupae at Hermitage Kloof. These immatures frequented a similar habitat to that of the Oudebosch specimens, but in this case the task of collection was easy, for the roof of the overhang was seven feet high and permitted free access to the sand spits in the streamlet. Although the larvae were not bred, there can be no doubt as to the correlation.

The larva reveals a striking similarity to that of *Protoplasa fitchii* O.S. (Alexander, 1930, pp. 223–225, pls. 5, 6), especially with regard to the arrangement of the minute spiracles. The pupa is even more primitive than that of *P. fitchii*, differing vastly in the shape of the pronotal breathing horns, mouth parts and lack of cephalic crest.

FAMILY TIPULIDAE.

1758. Linnaeus, p. 585.

In the S.W. Cape region this family is composed of the two subfamilies—the Tipulinae and the Limoniinae.

Key to Subfamilies and Genera in S.W. Cape.

Imagos.

1. Terminal joint of maxillary palpi elongate, whiplike, from two and a half to six times the length of the penultimate (figs. 4, *e*, 7, *a*); nasus usually distinct; antennae with 13 joints; wings with Sc_1 atrophied, vein Cu_1 constricted at $m-cu$, the latter at or close to fork of M_{3+4} (fig. 35, *a*) (*Tipulinae*) 2.
- Terminal joint of maxillary palpi short; no distinct nasus; antennae with 14 or 16 joints; wings with Sc_1 present, vein Cu_1 straight, not constricted at $m-cu$, the latter placed far before fork of M_{3+4} , usually at or close to fork of M (figs. 57, *a*, 59, *a*) (*Limoniinae*) 9.
2. Species normally winged 4.
- Species apterous, *i.e.* wings equal to or less than halter, or subapterous, *i.e.* wings longer than halter but not more than four times its length 3.
3. Males; hypopygium simple in structure, deeply V-shaped (dorsal view), dististyles recurved, lying along basistyles, armed with spines (lateral view), apical region of inner dististyle prolonged into a strong hook; females possess the normal type of ovipositor (fig. 8, *a*, *b*, *c*), *i.e.* the valves acicular; nasus usually bifid *Longurio*.
- No subapterous males; females possess an unusual type of ovipositor (fig. 14, *e*, *f*, *g*), *i.e.* the valves reduced, fleshy, not acicular; nasus not bifid, although often produced *Tipula*.
4. Male hypopygium simple in structure, deeply V-shaped (dorsal view), dististyles recurved, lying along basistyles; nasus usually bifid *Longurio*.
- Male hypopygium not V-shaped; nasus entire 5.
5. Legs long and filiform; wings (fig. 28, *c*) with vein R_{1+2} usually atrophied and Sc joining R at origin of RS so that RS appears as a continuation of Sc ; 1st M_2 open by atrophy of basal section of M_3 , the outer medial field thus appearing pectinately branched; macrotrichia present in apical cells of wing; male hypopygium has ventrad of ninth tergite a conspicuous flattened lobe of specific shape, covered with black spicules; body coloration obscure yellow and dark brown *Dolichocheza*.
- Legs of normal stoutness for this family; wings (fig. 48, *a*) with R_{1+2} usually preserved and Sc joining R far beyond origin of Rs so that RS does *not* appear as a continuation of Sc ; 1st M_2 cell present; no macrotrichia in apical cells of wing; male hypopygium without any lobe beneath ninth tergite 6.

6. Antennae elongate in male, 12-jointed 7.
 Antennae of normal length, 13-jointed 8.
7. Wings (fig. 48, *a*) with anal angle practically lacking;
 "anal furrow" evident, almost attaining wing margin;
 in male hypopygium one dististyle articulates with each
 basistyle; winged females with ovipositor valves reduced,
 fleshy, not acicular *Goniotipula*.
 Wings with anal angle present; "anal furrow" not attain-
 ing wing margin, ending about the insertion of m-cu
 into Cu; in male hypopygium two dististyles articulate
 with each basistyle; winged females with the ovipositor
 valves long, chitinised, acicular *Habromastix*.*
8. Body coloration highly polished, often black and yellow;
 wings with RS short and oblique in position, shorter
 than m-cu; cell M_1 sessile or very short-petiolate; vein
 M_4 arising opposite or basad of origin of M_{1+2} *Nephrotoma*.
 Body coloration dull fawn, or vivid green and brown;
 wings with RS long, i.e. exceeding m-cu (except *Tipula*
 jocosa, where RS equals m-cu); cell M_1 petiolate; vein M_4
 arising distad of origin of M_{1+2} *Tipula*.
9. Subapterous, i.e. wings are mere pads *Platylimnobia*.
 Wing of normal size 10.
10. Front of head produced into a slender rostrum that
 exceeds in length the combined head and thorax *Elephantomyia*.
 Front of head not produced into such a rostrum, at most
 not exceeding the head 11.
11. Wings with free tip of Sc_2 often present (fig. 55, *b*);
 veins R_4 and R_5 fused as far as margin so that only
 two branches of RS are present (fig. 55, *b*); antennae
 with 14 or 16 joints; male hypopygium with basistyles
 short; ventral dististyle large, fleshy and bulbous,
 longer than basistyles (except *Antocha*, where basistyles
 are long and dististyles not fleshy and bulbous; in
 this case anal angle of wing is very prominent, almost
 square (fig. 60, *b*) 12.
 Wings with free tip of Sc_2 atrophied (fig. 83, *a*); veins R_4
 and R_5 separate, the former usually transferred to upper
 branch (R_{2+3}) to form a distinct element R_{2+3+4}
 (fig. 66, *a*), i.e. three branches of RS present (except
 Atarba and *Teucholabis*, where R_4 is captured by R_{2+3}
 as above—in which case see male hypopygium); an-
 tennae usually with 16 joints; male hypopygium with
 basistyles long; ventral dististyle not large, nor fleshy
 and bulbous; anal angle of wing not prominent or
 square 13.

* Alexander (1921, pp. 218, 219) described two species of this genus from Natal and Zululand, and recently (1945, p. 96) another new species from Mossel Bay in the S.W. Cape region.

12. Wings with RS long and straight, diverging at an acute angle from R_1 (fig. 60, *b*); antennae 16-jointed; anal angle of wing very prominent, almost square *Antocha*.
 Wings with RS shorter and more arcuated (fig. 55); antennae usually 14-jointed; anal angle of wing not square *Limonia*.
13. Anterior arculus of wing lacking (fig. 61) *Pseudolimnophila*.
 Anterior arculus present 14.
14. Thoracic praescutum produced cephalad over pronotum *Conosia*.
 Praescutum normal, not produced 15.
15. Wings with only two branches of RS present (fig. 86) 16.
 Wings with three branches of RS present (fig. 66, *a*) 17.
16. Wings with vein R_2 present, close to fork of RS; Sc usually long, Sc_1 ending beyond origin of RS (fig. 86, *a*) *Teucholabis*.
 Wings with vein R_2 lacking; Sc short, ending opposite or before origin of RS (fig. 82, *a*) *Atarba*.
17. Cell M_1 present *Limnophila*.
 Cell M_1 absent 18.
18. Wings with cell R_3 short, vein R_3 shorter than or about equal to petiole of cell R_3 19.
 Wings with cell R_3 deep, vein R_3 longer than petiole of cell R_3 20.
19. Wings with cell R_3 very short, *i.e.* vein R_3 less than one-half the petiole of cell R_3 ; two dististyles articulate with each basistyle of male hypopygium *Rhabdomastix*.
 Wings with cell R_3 short, *i.e.* vein R_3 about equal to petiole of cell R_3 ; only one dististyle articulates with each basistyle of male hypopygium *Limnophilomyia*.
20. Wings with distinct macrotrichia in outer cells; RS ending in cell R_3 , this cell thus being sessile, almost without an element R_{2+3+4} *Dasymolophilus*.
 Wings glabrous in outer cells; RS ending in cell R_4 (fig. 89, *a*), cell R_3 being petiolate by presence of a distinct element R_{2+3+4} 21.
21. Wings with veins R_3 and R_4 nearly equal in length or with R_3 exceeding three-quarters of R_4 , the veins extending generally parallel to one another as far as wing margin; cell R_2 at margin wider than cell R_3 (Note: *Erioptera bonae spei* and *Erioptera clausa*) 22.
 Wings with veins R_3 and R_4 divergent, unequal in length, R_3 being thus less than two-thirds of R_4 ; cell R_3 at margin much more extensive than cell R_2 *Gonomyia*.
22. Wings with Sc_2 far removed from tip of Sc_1 , the latter vein long, subequal in length to RS; m-cu inserted before fork of M by a distance equal to one and a half times m-cu *Podoneura*.
 Wings with Sc_2 not far removed from tip of Sc_1 , the latter vein at most one-half length of RS; m-cu at or distad to fork of M 23.

23. Coxae of middle and hind legs only slightly separated by the small meral region *Gnophomyia*.
 Coxae of middle and hind legs widely separated by large "pot-bellied" meral region 24.
24. Wings with vein Cu_1 nearly straight, its distal section not swinging cephalad towards wing tip; cell 1st M_2 small, less than one-half the distal section of M_{1+2} ; terminal three joints of flagellum of antennae smaller than the previous three joints *Trimicra*.
 Wings with vein Cu_1 having its distal section slightly deflected at apex towards wing tip; cell 1st M_2 , when present, elongate, subequal to or longer than distal section of M_{1+2} ; flagellar joints progressively smaller to distal end *Erioptera*.

Larvae.

1. Spiracular disc surrounded by six to eight lobes (*Tipulinae*) 2.
 Spiracular disc not as above (*Limoniinae*) 7.
2. Moss dwellers *Dolichopeza*.
 Not moss dwellers 3.
3. If aquatic, in mud or beneath mats of *Juncus* in or near streams or springs; never moss dwellers; anal gills large and conspicuous (figs. 9, c, 12, a, b) *Tipula*.
 Soil dwellers, not aquatic, far removed from actual streams or springs, i.e. in shady woods or open mountain slopes; anal gills usually absent, anus blown out; if gills present, not conspicuous 4.
4. Spiracular disc with six distinct and large lobes (fig. 21, a) 5.
 Spiracular disc lobeless at first glance, with indications of four to six lobelets, which are never large 6.
5. Large forms (22–23 mm., diameter 3–4 mm.); spiracular disc with very large lobes, conspicuous *Nephrotoma*.
 Small forms (10 mm., diameter 3 mm.); spiracular disc with smaller lobes *Goniotipula*.
6. Spiracular disc with six minute lobes *Tipula*.
 Spiracular disc with four minute lobes *Longurio*.
7. Spiracular disc absent or lobeless 8.
 Spiracular disc surrounded by distinct lobes, although these may be small in size 12.
8. Spiracular disc lobeless but having a strongly curved chitinised hook caudad of each spiracle (fig. 34, g, h) *Longurio*.
 Spiracular disc without hook next to spiracles 9.
9. Creeping welts or pedal warts present 10.
 No pads, welts or warts *Rhabdomastix*.
10. Larvae small (11–12 mm.); creeping welts striplike, narrow 11.
 Larvae larger (19–20 mm.); pedal warts large, prominent globular swellings *Limnophilomyia*.

11. Creeping welts dorsal (abdominal tergites 2-7) and also ventral (abdominal sternites 1-7) *Limonia*.
 Creeping welts ventral only (abdominal sternites 5-7) *Elephantomyia*.
12. Spiracular disc squarely truncate, surrounded by five lobes, of which dorsal lobe may be small but distinct 13.
 Spiracular disc surrounded by four lobes 16.
13. Larvae aquatic, not wood feeders 14.
 Larvae wood feeders 15.
14. Spiracular disc without a fringe of hairs along margins of lobes; inner surfaces of lobes with a conspicuous pattern of dark markings; mandible uniformly wide, apical region split up into teeth (fig. 87, *d, f*) *Gonomyia*.
 Lobes of disc fringed with moderately long hairs along outer margins; inner surfaces of lobes clear, without pattern of markings; mandible broad at base, tapering gradually to a large apical hooked tooth (fig. 104, *a, c*) *Trimicra*.
15. Creeping welts on abdominal segments 2-7; mandibles powerful, massive; larvae actually feeding on the wood *Pseudolimnophila*.
 Creeping welts on abdominal segments 5-7; mandibles minute, difficult to find in head capsule; larvae feeding on rust-coloured scum just beneath hard bark of decaying trees *Elephantomyia*.
16. Creeping welts dorsal (abdominal tergites 2-7) and also ventral (abdominal sternites 1-7); larvae in silt-covered jelly tubes in moss or on rocks; incapable of distending abdominal segment prior to disc; head capsule massive, compact *Limonia*.
 Creeping welts absent; body pubescent; larvae in gravelly sand or mud spits, not in moss or on rocks; often capable of distending subterminal abdominal segment; head capsule dissected (fig. 70, *e*) 17.
17. Maxilla (fig. 70, *e*) an elongate flattened projecting blade 18.
 Maxilla not an elongate blade *Erioptera*.
18. Mandible with a single ventral cutting tooth (fig. 84, *d*); spiracular disc with ventral lobes much longer than dorsal pair *Conosia*.
 Mandible with three to four ventral cutting teeth (fig. 70, *a*); disc with microscopic lobes or with lobes greatly elongated but of equal length *Limnophila*.

Pupae.

1. Maxillary palpi sheaths strongly curved or recurved at tips (*Tipulinae*) 2.
 Maxillary palpi not recurved at tips 7.
2. Moss dwellers *Dolichocheza*.
 Not moss dwellers 3.
3. If aquatic, in mud or beneath mats of *Juncus* in or near streams or springs, never moss dwellers *Tipula*.

- Soil dwellers, far removed from actual streams or springs,
i.e. in shady woods or on open mountain slopes . . . 4.
4. Maxillary palpi recurved at tips *Nephrotoma*.
Maxillary palpi strongly curved, not recurved at tips . . . 5.
5. Cephalic crest insignificant; chaetotaxy greatly elongated,
striking *Goniotipula*.
Cephalic crest conspicuous; chaetotaxy short, not
conspicuous 6.
6. Breathing horns long and curved or elongate-clavate;
cauda practically unarmed on eighth segment; ventral
spines absent; female cauda without tergal sheaths . . . *Tipula*.
Breathing horns long, not curved, cylindrical, bluntly
rounded apically, or breathing horns microscopic and
bloblike; eighth segment of cauda with two to eight
lobes; female cauda with tergal and sternal sheaths . . . *Longurio*.
7. Wood dwellers (decaying logs) 8.
Aquatic 10.
8. Rostral sheath elongated (figs. 79, b, 81, e) *Elephantomyia*.
Rostral sheath normal, not elongated 9.
9. Cephalic crest small, a transverse ridge; breathing horns
flattened tapering blades; abdominal segments devoid
of spinal armature; scurfy basal transverse welt on
abdominal tergites 3-6 *Limnophilomyia*.
Cephalic crest pronounced with setiferous tubercles;
breathing horns slender, tubular; abdominal segments
with subterminal transverse row of spines and setae;
no welts on tergites *Pseudolimnophila*.
10. Pupae in silt covered jelly tubes in moss or on rocks;
basal transverse welt of hooks and spines on tergites
3-7 and sternites 5-7 *Limonia*.
Pupae in gravelly sand or mud spits; no welts on tergites
or sternites 11.
11. Breathing horns microscopic, mere raised tubercles. . . 15.
Breathing horns large, conspicuous 12.
12. Breathing horns wide basally, twisted into flattened
blades *Trimicra*.
Breathing horns not usually twisted; if slightly twisted,
this occurs apically and not basally and the breathing
horns are not flattened 13.
13. Deeply depressed areas on thorax behind each breathing
horn; median carina present *Gonomyia*.
No depressed areas on thorax, entire thorax convex . . . 14.
14. Breathing horns slightly twisted apically into a dilated
funnel-shaped opening *Conosia*.
Breathing horns not dilated apically or even twisted,
cylindrical or tapering gradually to narrow apex. *Limnophila*.
15. Cephalic crest conspicuous, consisting of numerous acute
spines *Rhabdomastix*.
Cephalic crest absent *Erioptera*.

Genus TIPULA Linnaeus.

1758. p. 585.

Imago.—Males normally winged; females winged, with long slender legs, or subapterous and physogastric with short stout legs; tibial spurs 1, 2, 2; nasus usually distinct, not bifid; terminal joint of maxillary palpi elongate, whiplike, two and a half times to four times the length of penultimate joint; antennae 13-jointed, joints swollen basally; wings with Sc_2 entering Sc far beyond origin of RS , usually opposite mid-length of RS ; RS elongate, exceeding $m-cu$ (except *jocosa*), vein R_{1+2} preserved, cell M_1 petiolate, never sessile, vein M_4 arising distad to origin of M_{1+2} , 1st M_2 present; body coloration usually opaque; ♂ hypopygium with ninth tergite notched and lobed according to species, ninth sternite not as elongated as in genus *Longurio*, two dististyles articulate with each basistyle (except *caffra*), the inner dististyle usually a complex structure; ♀ ovipositor usually elongate, valves acicular; often reduced in subapterous ♀ to short inconspicuous truncate lobes ("*coronata*" group).

Larva.—Form plump, terete. Chaetotaxy composed of stiff setae. Spiracular disc surrounded by six lobes (except *caffra*). Head capsule retractile, compact, with the posterior incisions shallow; antennae of varying length according to species, as long as broad to four times as long as broad, cylindrical, apical papilla small, at most one-quarter the basal segment (except *coronata*), often reduced and inconspicuous, surrounded by three to four sensory pegs. Mandible small for so massive a head capsule, produced into an apical tooth and often with a ventral cutting tooth. Maxilla of *Limonian* construction, variously armed with hairs and setae according to species. Labrum having two circular areas bearing various setae. Hypopharynx with five stout teeth (except *coronata*); prementum a fleshy scurfy rounded lobe; mentum with seven teeth. Anal gills four ("*soror*" group) or absent ("*coronata*" group), if present, of varying specific shape.

Pupa.—Form slender to stout. Cephalic crest usually lacking ("*soror*" group) or conspicuous ("*coronata*" group). Mouth parts with sheaths of maxillary palpi strongly recurved ("*soror*" group) or strongly curved ("*coronata*" group). Pronotal breathing horns equal in length, short-cylindrical ("*soror*" group) or elongate ("*coronata*" group), tips rounded or slightly dilated. Wing pads usually extend to end of abdominal segment 2 in ♂♂ and ♀♀; legs short (end of abdominal segment 3 in all ♀♀ and ♂♂ of "*soror*" group) or long

(end of abdominal segment 6, 7 or 8 in ♂♂ of "*coronata*" group.) Armature of abdominal segments strong, each segment having a transverse row of a varying number of spines along posterior margin. Cauda with four powerful dorsal lobes, the eighth segment of cauda supplying an additional eight lobelike spines, four ventral, one pleural on each side and two dorso-median spines situated between the anterior lobes of cauda ("*soror*" group) or eighth segment with the ventral spines absent; sheaths enclosing ninth sternites of ♂♂ hypopygia of varying shape and length according to species.

Five species of *Tipula* frequent the S.W. Cape region. The life-histories of all five have been determined and show that the immatures occur in a wide range of environment as follows:—

T. soror: Wet saturated moss, mud or ooze on cliff walls.

T. pomposa: Damp organic soil or mud on extreme edge of streams.

T. jocosca: Beneath mats of *Juncus* on edge or partially immersed in swift streams.

T. coronata: In dry soil beneath *Restio* clumps on mountain slopes.

T. caffra: As in *coronata*, also in rich soil of shady woods.

The study of the genus has revealed that two natural groups of imago exist. In the "*soror*" group (*T. soror*, *pomposa*, *jocosca*) both sexes are large and normally winged, possessing the typical features of the genus, the ♀♀ having the normal Tipuline ovipositor. In the "*coronata*" group (*T. coronata* and *caffra*) the ♂♂ are normally winged and small, while the ♀♀ are subapterous, physogastric, and differ vastly in appearance, structure, and ovipositor apparatus from the "*soror*" group. This natural grouping is consolidated by the structure of the head capsule and spiracular disc of the larvae, and by the general features of the pupae. The ♀♀ of the "*coronata*" group are easily distinguished by their unusual form of ovipositor from the subapterous ♀♀ of *Longurio* (compare figs. 8, *a*, *b*, *c* and 14, *e*, *f*, *g*).

In 1929 in Diptera of Patagonia and South Chile (pp. 34, 35) Alexander described at some length the structure of the male hypopygium of the genus *Tipula*, stating this to be the most important character for the separation of the different species. He writes "the basistyle of median to small size, usually entirely separate from the sternite by a suture, the latter sometimes obsolete on its dorsal portion." (This is applicable to the S.W. Cape species.) "The ventro-caudal angle of the basistyle usually produced into a lobe, this sometimes lacking or very small, in others small and scarcely longer than broad, in the extreme cases very long and conspicuous, being

from eight to ten times as long as thick." (In the S.W. Cape species this ventro-caudal lobe on the basistyles is entirely absent.)

"On the mesal face of the basistyles is borne a caudal lobe of various forms that furnishes important specific characters." In some figures which he submits (figs. 127 and 136) Alexander shows this lobe to be continuous with or produced from the basistyle. In other figures (121, 130, 142, 147, 155, 158) he does not show the actual origin of this lobe from the basistyle. (In the S.W. Cape species this lobe is absent.) Two dististyles articulate with the mesal face of the basistyle: the outer dististyle is a fleshy flattened lobe, sparsely haired; the inner dististyle is a *single* complex structure of varying shape and with different projections which arise from the common basal portion (see fig. 4, *a, b, c* of *T. soror*).

The penis is bulbous basally, situated at the junction of the eighth and ninth sternites, and consists of a slender tube which is ventrally curved and which emerges from the aedeagal sheath attached medially to the incision of the ninth sternite. Due to this arrangement, the "latera" and "basum" (lateral and basal plates of the penis)—processes for the attachment of muscles—have undergone a torsion of 180 degrees, the former plates being directed dorsally, the latter caudally (not cephalad as in other genera).

Key to Species of Tipula.

♂ Imagos.

1. Large forms (17–21 mm.; wings 17–23 mm.) ("*soror*" group) 3.
 Smaller forms (8–10 mm.; wings 9–12 mm.) ("*coronata*" group) 2.
2. Ninth tergite deeply incised medially into two triangular lobes, the apices of which are subacute (fig. 17, *b*); each basistyle bears only *one* dististyle (fig. 17, *c*) *caffra*.
 Ninth tergite not deeply incised, usually with the caudal margin or surface produced into a median lobe (fig. 13, *b*); each basistyle bears *two* dististyles (fig. 13, *a*) *coronata*.
3. Outer dististyle a flattened fleshy pubescent lobe, triangular, apex bluntly rounded (figs. 4, *c*; 11, *c*); ninth tergite produced into a median lobe, either broad and squarely truncated or slender and truncate with a slight notch (fig. 4, *f*; 11, *d*) 4.
 Outer dististyle a flattened fleshy pubescent lobe, narrow in shape, slightly swollen after mid-length, bluntly rounded apically (fig. 7, *b, e*); ninth tergite with its median area produced ventrad and slightly caudad into a pendulous pale fleshy lobe densely haired (fig. 7, *c*) *jocosa*.
4. Inner dististyle (fig. 4, *a, b*) with two hooks and two blades; ninth tergite with its median lobe broad (fig. 4, *f*) *soror*.

Inner dististyle (fig. 11, *a, b*) with one ridged and one curved blade,
no hooks present; ninth tergite with its median lobe narrow and
slender (fig. 11, *d*) *pomposa*.

♀ Imagos.

1. Subapterous, wings about equal to length of a halter; body
physogastric; ovipositor reduced, inconspicuous ("coronata"
group) 2.
Normal wings, *i.e.* apex reaches end of abdomen; body slender,
not physogastric; ovipositor of normal shape, acicular, slender;
large forms (23–28 mm., wings 19–29 mm.) ("soror" group) . . . 3.
2. Flagellar joint 1 of antennae twice as long as broadest diameter;
ultimate joint equal to penultimate, elongate-cylindrical
(fig. 14, *c*); wings (fig. 14, *d*) gradually swelling from the base to
the wide rounded apex, costal margin almost straight; legs
long (see table p. 52); ventral ovipositor valves (fig. 14, *f*)
forming a shallow median groove *coronata*.
Flagellar joint 1 not clavate, elongate-cylindrical, three times as
long as broad, ultimate joint twice the penultimate, conical
(fig. 17, *g*); wings (fig. 17, *i*) constricted near base, curved,
costal margin curved; legs short (see table, p. 60); ventral
ovipositor valves forming a deep median groove *caffra*.
3. Freshly caught specimens possess a vivid greenish coloration on
thorax and wings which fades in older specimens to dull yellow
and brownish on wings; costal margin unshaded up to the
stigma; RS short, shorter than m-cu, three times basal
deflection of R_{4+5} *jocosa*.
Freshly caught specimens usually brown on thorax and wings;
costal margin shaded to stigma with a brown suffusion, extend-
ing to vein R in depth; RS long, four and a half to five times
the basal deflection of R_{4+5} 4.
4. Large females (27 mm., wings 23–28 mm.); shading along costal
margin stops at end of stigma; Cu devoid of shading; 1st M_2
as large as that of *jocosa* *pomposa*.
Smaller females (23–24 mm., wings 19–20 mm.); shading along
costal margin continuous along RS and R_3 to wing tip; shading
present along Cu; 1st M_2 small *soror*.

Larvae.

1. Spiracular disc surrounded by six conspicuous lobes (fig. 5, *g, h*);
anal gills large and conspicuous (fig. 5, *g*) ("soror" group) . . . 2.
Spiracular disc with minute lobes, in which case larva never
exceeds 20 mm., or disc with mere indications of six microscopic
lobes, in which case larva never exceeds 27 mm.; anal gills
absent, actual margins of anus usually distended and conspicuous
(fig. 15, *d*) ("coronata" group) 4.

2. Colour jet black, integument opaque; chaetotaxy absent; if present, microscopic and difficult to detect against body colour, replaced by groups of twenty short stiffened hairs; anal gills black; length of fully grown larva 50-55 mm., diameter 7-8 mm. *pomposa.*
- Colour fawn to sepia brown, never black; integument opaque or transparent; black chaetotaxy conspicuous against body colour; anal gills white or dull fawn; length never exceeds 20-23 mm. 3.
3. Anal gills dull fawn, massive, caudal pair produced laterad and abruptly narrowed to slender apices (fig. 5, *g*), cephalic pair broad, each lateral angle square; maxilla (fig. 5, *f*) with outer lobe devoid of hairs or setae *soror.*
- Anal gills white and thus outstanding against body colour, elongate, curved round body surface, slender, tapering to rounded apices, each gill bearing basally a small lobule about one-sixth the length of the gill (fig. 9, *c*); maxilla (fig. 9, *d*) with outer lobe very pubescent over its whole surface, extreme edge fringed with hairs and curved acute hairlike setae, on the inner edge a small palpus with sensory pegs *jocosa.*
4. Spiracular disc (fig. 18, *d*) surrounded by six short lobes, clearly visible, lateral and dorsal lobes wide at origin, then suddenly narrowed to slender outwardly curved apices; labrum narrow (fig. 18, *a*); antennae (fig. 18, *a*) elongate-cylindrical, twice its diameter; hypopharynx (fig. 18, *b*) with five anterior teeth, middle tooth the longest; chaetotaxy very short, tips of setae just visible above the layer of soil grains adhering to the integument; pleural setae of abdominal segments situated on a large conspicuous fleshy protuberance *caffra.*
- Spiracular disc apparently lobeless at first sight, closer examination reveals six microscopic fleshy lobelets (fig. 15, *d*), the dorsal pair mere tubercles for the elongate setae; labrum broad (fig. 15, *b*); antennae (fig. 15, *b*) short-cylindrical, as long as broad; hypopharynx (fig. 15, *a*) with three anterior teeth, middle tooth the smallest; chaetotaxy of moderate length, conspicuous against body colour; no pleural protuberance on abdominal segments *coronata.*

Pupae.

1. Small forms (11-16 mm., diameter 2-3.2 mm.); breathing horns long and curved, or if shorter and not curved, shape is elongate-clavate, not cylindrical; cephalic crest conspicuous, distinct (fig. 19, *a, b*); maxillary palpi strongly curved but not recurved at tips; cauda (fig. 19, *c*) unarmed on eighth segment except for each large pleural spine or armed with two additional dorso-median spines, thus the ventral spines in both these cases absent; female cauda with the tergal sheaths absent 2.

- Large forms (18-31 mm., diameter 2.6-5.5 mm.); breathing horns short, cylindrical, not clavate, apices sometimes slightly dilated; cephalic crest at most a minute fleshy conical tubercle at base of antennal sheaths; maxillary palpi strongly recurved at tips; eighth segment of cauda (fig. 6, *g*) with eight lobelike spines, *i.e.* two dorso-median spines, one pleural spine on each side and four ventral spines 3.
2. Cephalic crest (fig. 19, *a, b*) a stout wide chitinated median lobe, each outer angle produced into a thick blunt hook (ventral aspect); crest wide and stout at origin, tapering to an acute ventrally curved apex (lateral aspect) (fig. 19, *b*); male cauda (fig. 19, *d*) with anterior dorsal lobes smaller than posterior dorsal lobes, the latter wide at base, almost truncate apically, each outer angle further prolonged into an acute spine; ventral spine on sheaths of ninth sternite much enlarged and conspicuous, scarcely projecting beyond tip of posterior dorsal lobes; eighth segment of cauda unarmed except for a prominent pleural spine even longer than the anterior dorsal lobes; female cauda (fig. 19, *c, e*) has no ventral spines on sternal sheaths, apex of cauda oblique, not truncate *caffra*.
- Cephalic crest (fig. 16, *a*) a stout, moderately long median lobe, bifid, the incision deep; crest wide, dorsal margin strongly curved to a spinous apex (lateral aspect) (fig. 16, *b*); male cauda (fig. 16, *c, d*) with the anterior dorsal lobes much larger than the small bulbous posterior lobes; segment eight of cauda has only two dorso-median spines between anterior dorsal lobes, two large pleural spines present on each side, ventral spines on sheaths of ninth sternites projecting far beyond tip of posterior dorsal lobes; female cauda (fig. 16, *e, f*) with apex practically truncate, consequently the two anterior dorsal lobes, the two dorso-median spines and the lateral spines form a ring round the bulbous posterior dorsal lobes; ventral spines on sternal sheaths conspicuous, apices acute *coronata*.
3. Sheaths enclosing ninth sternites of male hypopygium enormous, projecting beyond posterior dorsal lobes of cauda (fig. 10, *a, b*); no lobule or spines laterad of base of each anterior dorsal lobe *soror*.
- Sheaths of ninth sternites not longer than posterior dorsal lobes, often reduced and considerably shorter; lobule or spines laterad of base of each anterior dorsal lobe 4.
4. Colour warm brown to black; large forms (25-31 mm., diameter 5-5.5 mm.); sheaths of ninth sternites end opposite tips of posterior dorsal lobes and therefore not longer than these lobes (fig. 10, *c, d*); laterad and cephalad of each anterior dorsal lobe a small bifid lobule (fig. 10, *c, d*) *pomposa*.
- Colour light brown; smaller forms (18-20 mm., diameter 2.6-3 mm.); sheaths of ninth sternites much reduced, just reaching base of posterior dorsal lobes (fig. 10, *e, f*); laterad of base of each anterior dorsal lobe occur two minute acute slender spines (fig. 10, *e, f*) *jocosa*.

Tipula soror Wiedemann.Figs. 4-6; 10, *a*, *b*.

1821. p. 24; 1828. p. 46.

1917. Alexander, p. 166, pl. xii, fig. 28 (wing); pl. xiii, fig. 49 (hypopygium); pl. xiv, fig. 58 (9th tergite).

♂: Length 18.6-19 mm., wing 19.1-20 mm.

Antennae (fig. 4, *g*) 13-jointed, light yellow, flagellar joint 1 elongate-fusiform, remaining joints swollen basally, then gradually tapering to a narrow apex, each enlargement bearing four to six black verticils, ultimate joint one-third the penultimate, conical. Palpi (fig. 4, *e*) light brown, two-thirds the length of the antennae, ultimate joint two and a half times the penultimate, whiplike, although not as elongate as in *T. pomposa* and *T. jocosu*.

An accurate drawing of the wing was given by Alexander in 1917. The most important feature for the classification of species of *Tipula*, however, is the male hypopygium, which was first figured and described by Alexander (1917, p. 166). "Ninth tergite moderate in size, the caudal margin concave with a very broad median lobe, whose caudal margin is squarely truncated and bifid for a short distance by a deep line; the caudal dorsal margin with numerous small black spicules. Outer pleural appendage [i.e. the outer dististyle] very broad and flat, pale, almost white, the apex somewhat obliquely truncated, the outer face with short, appressed hairs that are most numerous at the cephalic dorsal angle."

The apical margin of the outer dististyle is undulate, being produced at the proximal angle (fig. 4, *c*). This outer dististyle articulates in a socket on the mesal face of the basistyle which is small and irregularly rounded caudally (fig. 4, *d*), the dististyle thus being a separate structure and not a prolongation of the basistyle. Inner dististyle is a single complex structure partly visible through the translucent outer dististyle. From a lateral aspect (fig. 4, *a*) the outer surface of this dististyle is divided into two divergent hooks, the smaller tapering to a slender blackened apex and directed slightly inwards, the larger directed dorsally and suddenly narrowed to a slender apex which from a posterior aspect (fig. 4, *b*) is directed slightly outwards; on the caudal surface of this hook are nine to ten short tuberculate setae. On the inside of the smaller hook (H.) arises a flattened truncate blade (B.) which has the dorsal angle slightly produced; at the base

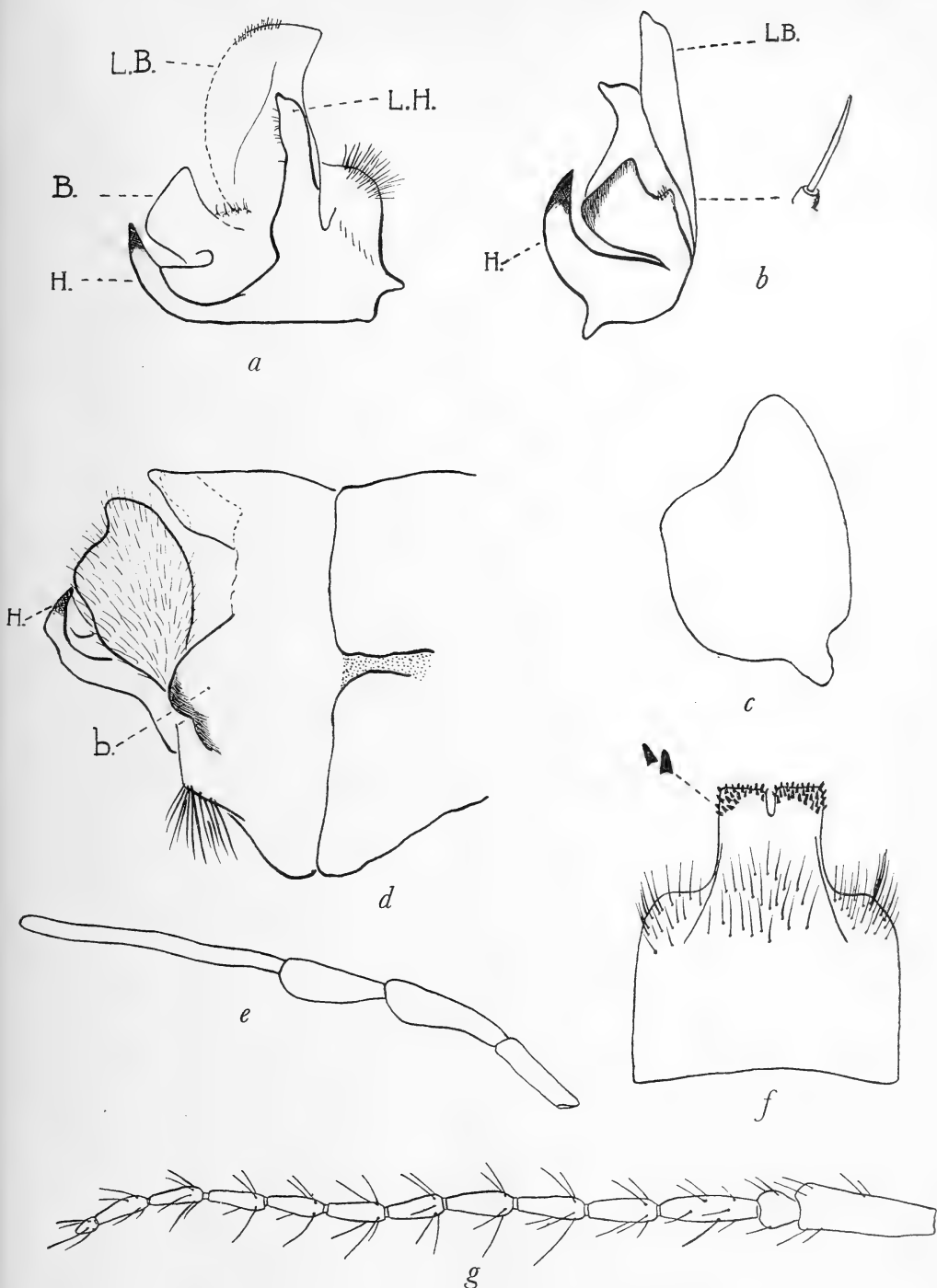


FIG. 4.—*Tipula soror*, Wiedemann. *a*, inner dististyle (male hypopygium); *b*, ditto, posterior view; *c*, outer dististyle (male hypopygium); *d*, end of abdomen (lateral view); *e*, maxillary palpus; *f*, ninth tergite (dorsal view); *g*, antenna.

of this blade occur seven to eight short tuberculate setae. On the inside of the larger hook (L.H.) is a large flattened blade (L.B.), heavily chitinated and strong along the cephalic region, but membranous and weaker along the caudal margin, which is curved and bears eighteen to twenty-two minute apical setae; at the base of the larger blade is a rounded protuberance bearing numerous yellow hairs. In normal position the apex of the large blade on this inner dististyle rests in the concavity of the ninth tergite. The planes in which the hooks and blades lie may be easily detected when the dististyle is viewed from a posterior aspect (fig. 4, *b*). Penis is bulbous basally, situated at the junction of the eighth and ninth segments and consists of a much elongated tube, curved ventrally and emerging from the aedeagal sheath attached medially to the deep incision of the ninth sternite; apex of penis bifid.

♀: Length 23.5–25 mm., wing 19.2–20 mm. Similar in colour, wing venation and general appearance to the male; ovipositor of normal tipuline type. Legs long and slender, thus:

	I	II	III
Femur . . .	8.5	10	12
Tibia . . .	10	10.2	14.1
Tarsus . . .	13	14	16
<hr/>			
Total . . .	31.5	34.2	42.1

Localities.—Cape Peninsula: Camps Bay slopes (K. H. B., H. G. W.), September 1932; Chapmans Peak (K. H. B., H. G. W.), November 1934; Glencairn Valley (K. H. B., H. G. W.), August 1932.

Cape Province: Landdrost (K. H. B.), 1917; French Hoek Pass (E. side) (G. A. W., H. G. W.), October 1933; Witte River Valley (G. A. W., H. G. W.), October 1933; Matroosberg (Lightfoot), November 1917; Olifants River, Clanwilliam (Lawrence), September 1932; Sneeuwgat Valley (K. H. B., C. W. T., H. G. W.), November 1933; Tradouw Pass (G. A. W., H. G. W.), January 1938; Hermanus (G. A. W.), March 1939.

Larva.—Length 33 mm., diameter 3 mm. Colour dull dirty fawn, the thoracic segments brownish yellow, the dorsa of abdominal segments darkened with light brown. Form terete, plump, greatest diameter at fifth abdominal segment; integument thin, revealing the

underlying muscles, covered with a dirty cream microscopic pubescence.

Chaetotaxy composed of short stiff setae, their blackish-brown colour making them conspicuous against the body colour in spite of their small size. Dorsum of prothorax with eight setae, a pair near each lateral margin and four evenly spaced minute setae across the mesal portion; pleura with three setae, one anterior and two at mid-length; venter with four setae, each outer seta large, the inner setae microscopic; meso- and metathoracic segments with eight evenly spaced pairs of setae; pleura with two setae, one anterior and one mesal; venter with a tuft of three setae on each lateral margin and two smaller setae. Dorsa of abdominal segments 1-7 have a transverse row of setae near the posterior margin, consisting of a single seta on either side of median line, laterad of each are two pairs of longer setae; cephalad of each outer pair is a group of twenty stiffened hairs from which projects a single large seta; pleura with four setae, one anterior and a group of three near posterior margin; venter with a pair of setae on either side of median line near posterior margin; at each postero-lateral corner a group of twenty short stiffened hairs appears as a black circular spot from which protrudes a long seta and near which is another median seta. Immediately cephalad of the gills is a ventral row of four evenly spaced setae and one pleural seta.

Spiracular disc (fig. 5, *g*, *h*) surrounded by six lobes of equal length, the two ventral lobes broad at the base, in the shape of an equilateral triangle, the two dorsal and the two lateral lobes narrower at the base, tapering to bluntly rounded apices, the inner surface of each dorsal lobe being margined with a thin stripe of dark brown; lateral lobes margined only by an outer strip of brown; ventral lobes with a transverse basal brown stripe, the central portion of which is blackened, giving an ocellate effect, apex of these lobes darkened with a blackish-brown circular dot; outer ring of spiracles dark blackish brown, inner portion darker black; spiracles large, circular, separated by two-thirds the diameter of one spiracle. Anal gills four (fig. 5, *g*), dull fawn, massive, the caudal pair produced sideways and abruptly narrowed to slender apices; cephalic pair broad, each lateral angle square.

Head capsule retractile, broad, compact and massive, heavily chitinised, posterior incisions shallow, the prefrontal sclerite large and conspicuous. Basal segment of antenna (fig. 5, *c*) elongate-cylindrical, four times as long as its diameter, the solitary apical papilla reduced



FIG. 5.—Larva of *Tipula soror* Wiedemann. *a*, hypopharynx and prementum; *b*, labrum (dorsal view); *c*, antenna; *d*, mentum; *e*, mandible; *f*, maxilla; *g*, end of abdomen with anal gills and spiracular lobes (ventral view); *h*, spiracular disc (posterior view).

to a minute cone, near which are two microscopic sensory pegs. Mandible (fig. 5, *e*), although heavily chitinated and strong, is small for the size of the head capsule, produced to a bluntly rounded apical tooth and a single truncate cutting tooth. Maxilla (fig. 5, *f*): cardo a slender tapering rod; inner lobe bearing a short cylindrical palpus with several sensory papillae at its apex, distad of this palpus is a set of six to eight closely placed stiff setae; outer lobe chitinated, irregular in shape, extreme angle hooked and devoid of setae and hairs. Labrum (fig. 5, *b*) large, conspicuous, having two chitinated areas near the apex, each ring armed with six inner tuberculate conical papillae and a fringe of ten outer hairlike setae, the apical set of five larger and truncate; apex of labrum bluntly rounded, its margin beset with twelve small papillae. Hypopharynx (fig. 5, *a*) consists of a broad flattened plate, the basal lateral angles of which are produced into strong chitinated arms, anterior margin divided into five broad blunt teeth, ventral surface of plate densely clothed with numerous stiff acute setae; dorsad of the hypopharynx and attached to it basally is a large rounded fleshy lobe—the prementum—covered with a microscopic scurfiness. Mentum (fig. 5, *d*) very broad, almost completely divided behind, anterior margin having three blunt teeth on either side of the long large median tooth.

Pupa.—Length 18–25 mm., diameter 2.5–3.2 mm. Colour light sepia to dark brown, wing pads pale yellowish brown on young pupae, dark brown to black in mature pupae, usually covered with minute grains of soil and debris which are easily removed; pleural region of abdomen yellow.

Form moderately slender; head of moderate size; cephalic crest absent, at most represented by a small conical tubercle at base of each antennal sheath (fig. 6, *e*), which is slender, moderately elongate, extending a short distance beyond the wing angle; labrum (fig. 6, *a*) broad; apex pointed; labial lobes oval, contiguous along inner margins; maxillary palpi strongly recurved at tips for three-eighths to one-half their length, tapering abruptly to acute points.

Pronotal breathing horns (fig. 6, *c*) rather short for so large a pupa but distinct, equal in length, cylindrical, margins slightly crenulate, tips rounded and slightly curved ventrally. Mesonotum transversely wrinkled. Wing pads extend to end of abdominal segment 2, venation clearly distinguishable; leg sheaths reaching end of abdominal segment 3, fore tarsi much shorter than the others which are equal in length, tips of all tarsi slightly curved inwards.

Abdominal segments 2–7 subdivided into two annuli of equal length,

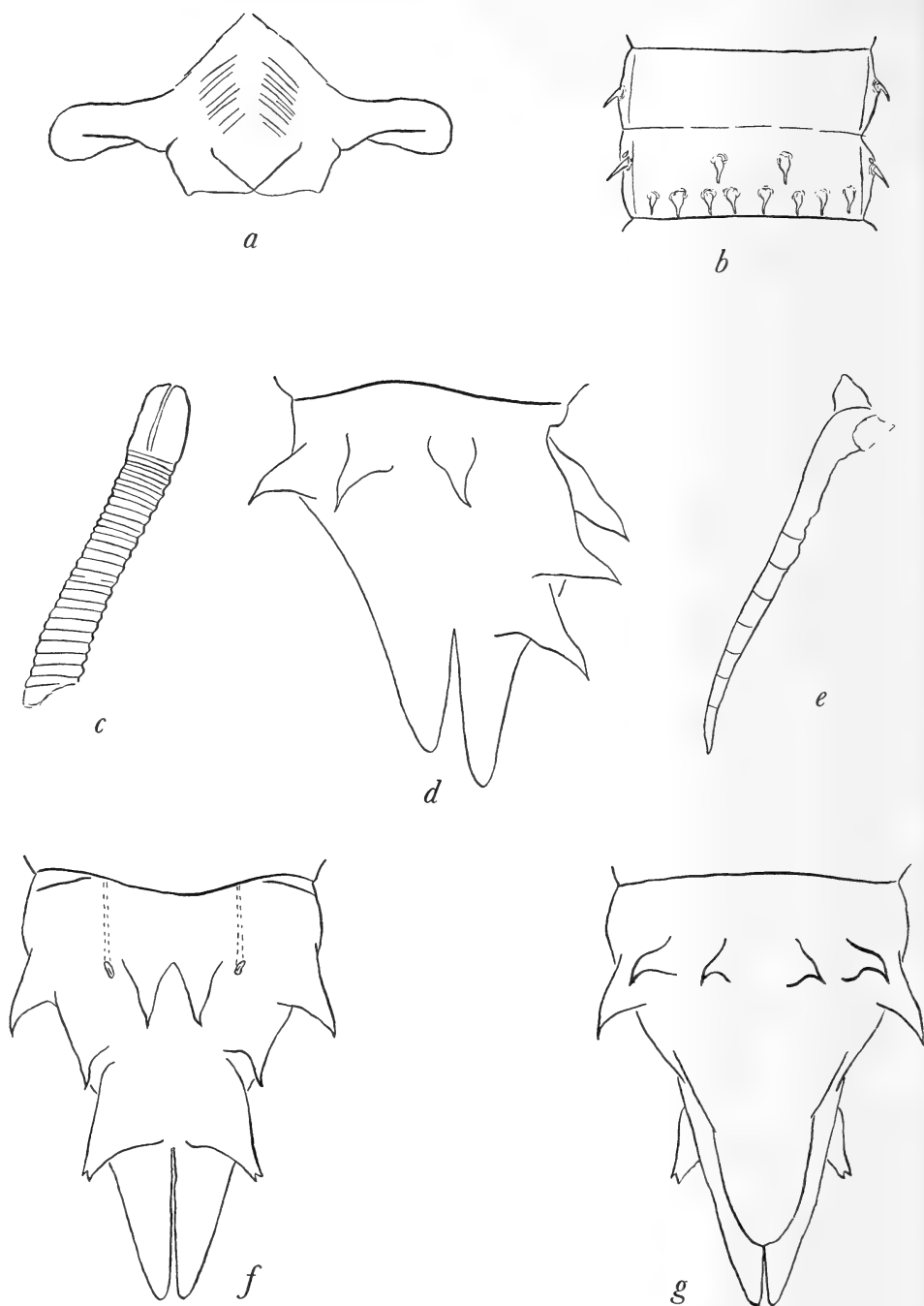


FIG. 6.—Pupa of *Tipula soror* Wiedemann. *a*, mouth parts; *b*, fifth abdominal segment (ventral view); *c*, pronotal breathing horn; *d*, female cauda (lateral view); *e*, antennal sheath; *f*, female cauda (dorsal view); *g*, female cauda (ventral view).

each anterior annulus devoid of spines or setae; in the pleural region there occurs a single conspicuous chitinated mammiliform spine at mid-length; the posterior annuli (fig. 6, *b*) being armed with stronger and stouter spines as follows: dorsum of segment 2 with a transverse row of four small acute spines, of segment 3 with six spines, of segments 4-7 with ten mammiliform spines, one on either side of median line, the remaining eight grouped in evenly spaced pairs; pleura of segments 3-7 with a single mesal spine, shorter than that on anterior annulus; venter of segment 3 with a pair on either side of leg sheaths, of segments 4-7 with a transverse row of eight to ten spines along caudal margin and two additional large mesal spines. Spiracles apparently lacking, detectable only after dissection of the empty pupal exuviae, wherein the tracheae are visible and terminate on the dorsal region of the cauda; the pleural spiracles are situated slightly cephalad of each posterior spine.

♂ cauda (fig. 10, *a, b*): armed with four powerful, stout dorsal lobes tapering to spinous chitinated apices, one at the base of each tergal sheath, the other two further cephalad and dorsad, the former lobes being longer, more slender and often with the apices slightly bifid; at the base of cauda, on segment eight, occurs a row of four ventral evenly spaced lobelike spines (fig. 10, *a*), a single pleural spine on each side and two dorso-median spines lying between the anterior pair of lobes of cauda; tergal sheaths short, but longer and more slender than the sternal sheaths which are thick at base, tapering abruptly to blunt apices.

♀ cauda (fig. 6, *f, g*): similar in armature to ♂; sheaths enclosing the ninth sternites are enormous, wide, blunt, longer than the posterior dorsal lobes, bearing an acute hooked spine at the ventral angle, the sheaths being produced on their inner apical surface into two rounded fingerlike median lobes, below which the sheaths are deeply incised along the median line.

Remarks.—Larvae and pupae of this species were discovered by Dr. Barnard and the author at Chapmans Peak in November 1934. In this locality the motor road is constructed along the contour of the shale band which marks the junction of the igneous granite rock and the sedimentary Table Mountain Sandstone. The impervious granite causes the water filtering through the horizontal and vertical bedding planes of the shale and sandstone to trickle out from numerous springs. Due to the constant supply of water small plants flourish at the base of one clifflike cutting, the saturated organic ooze and mud on the small ledges two to six inches in width providing an ideal

habitat for the immatures of *T. soror*. This locality is exposed to the direct sunlight throughout the day. An examination of the oesophagus of the larvae shows them to be vegetarian, feeding on rootlets and pieces of dead leaves. The pupal stadium occupies thirteen days; the pupae rest in a vertical position in the drier portions of the mud.

In Tradouw Pass (January 1938) Mrs. Wood and the author found four large larvae of this species in a similar type of environment, but here mosses and liverworts predominated on the small ledges, the locality being shaded for the greater part of the day by huge *Cunonia capensis* ("Rooiells") trees. At French Hoek Pass, Witte River Valley and Sneeuwgat Valley, adults of *T. soror* are to be found flying amid the clumps of short reeds which grow in the open marshy ground. The adults hang by the first pair of legs from the reeds with the wings almost at right angles to the body. It is probable that the immatures frequent the black saturated mud of these bogs.

Tipula jocosa Alex.

Figs. 7-9; 10, e, f.

1917. pp. 168-169, pl. xii, fig. 31 (wing).

1921. pp. 226-227, pl. iv, fig. 27 (9th tergite), fig. 28 (hypopygium).

♂: Length 17.5-18.5 mm., wing 18-18.5 mm. Freshly caught specimens are beautifully coloured with a vivid green sheen on the thorax and wings, which fades in older specimens to dull yellow on the thorax and brown on the wings.

Antennae similar to those of *T. soror*, the ultimate joint one-half the penultimate; palpi with ultimate joint four times the penultimate; decidedly whiplike, twice joints 1-3 combined.

Alexander's description (1921, pp. 226-227) and figures are excellent, although the actual shape of the dististyles is obscured by the dark shading. He states "ninth tergite large, ample, the posterior margin concave, the lateral angles slightly produced into thin, heavily chitinated lobes, the median area produced ventrad and slightly caudad into a pendulous pale fleshy lobe that is densely clothed with a fine pubescence."

The caudal margin of this ninth tergite is densely beset with minute black dorsal spicules. Basistyle small, slightly concave along the

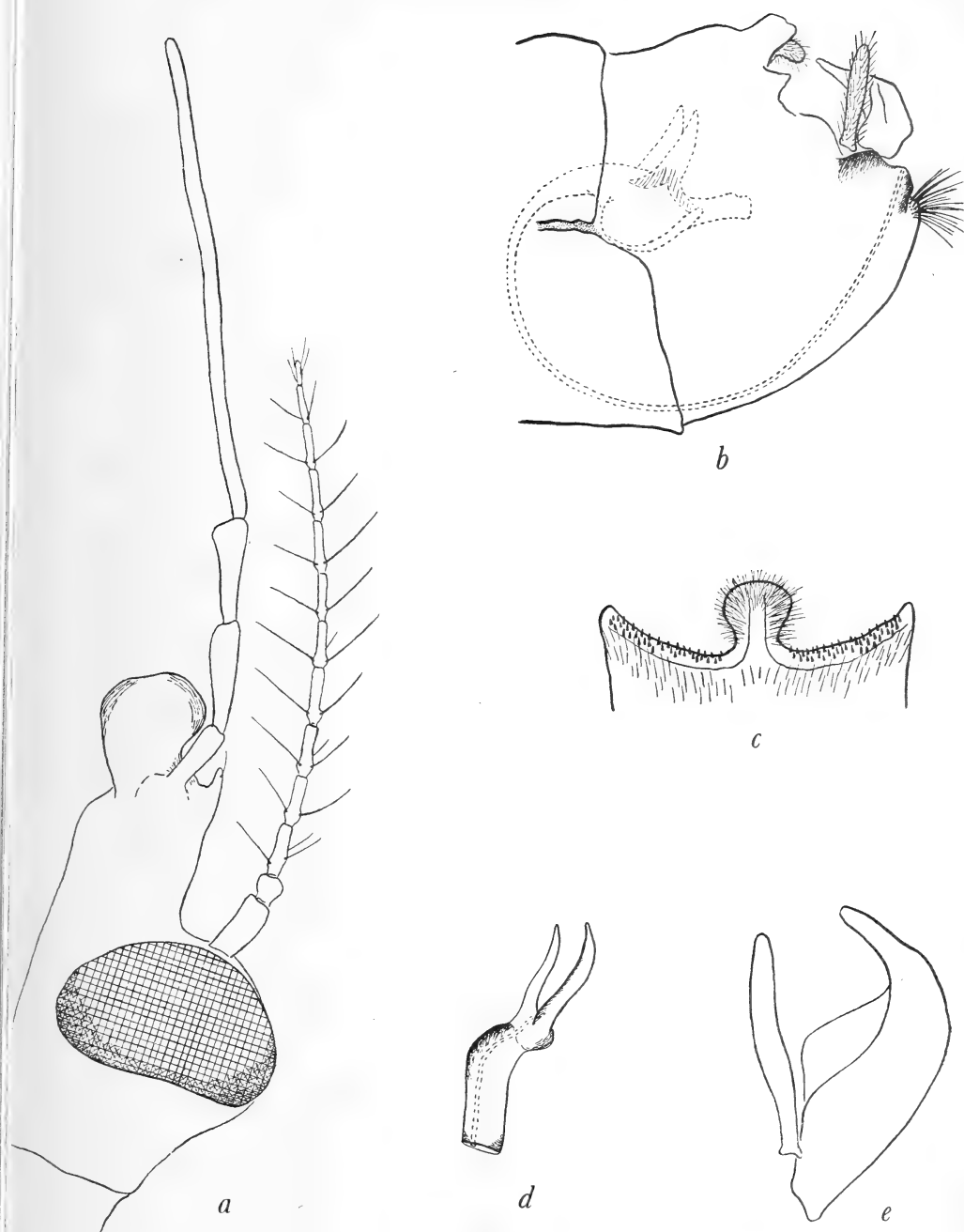


FIG. 7.—*Tipula jocosa* Alex. a, head of imago (lateral view); b, end of abdomen showing hypopygium and underlying penis (lateral view); c, ninth tergite (dorsal view); d, end of penis; e, outer and inner dististyles (male hypopygium).

caudal surface. Outer dististyle (fig. 7, *e*) a flat, narrow, pale fleshy lobe, sparsely haired, slightly swollen after mid-length, bluntly rounded apically; inner dististyle (fig. 7, *e*) heavily chitinised, its inner surface deeply concave, its outer surface consequently sharply carinate along its margin, the inner margin of the concavity produced, swollen and rounded, the outer surface produced into a conspicuous chitinised hook that is directed cephalad; basal surface of this dististyle clothed with numerous stiff hairs. From a posterior view a tuft of long yellow hairs is situated on the inner side of each basistyle immediately ventrad of the aedeagal sheath. Penis bulbous basally, remainder an elongate slender ventrally curved tube which is bifid apically (fig. 7, *d*) and which emerges from the slender aedeagal sheath attached to the base of the ninth sternite.

♀: Length 24.5–26 mm., wing 19.8–20.5 mm. Legs reveal the following lengths:—

		I	II	III
Femur	.	11	12.5	13.2
Tibia	.	14.5	15	16.5
Tarsus	.	19	19	20.5
<hr/>				
Total	.	44.5	46.5	50.2

Similar to male in vivid coloration, venation and appearance; ovipositor of normal tipuline type (fig. 8, *a*, *b*, *c*).

Localities.—Cape Peninsula: Platteklip (K. H. B.), March 1931, November 1933 (H. G. W.), February 1931; Lekkerwater (H. G. W.) February 1931, May 1933; Kirstenbosch (H. G. W.) November 1932; Fernwood (H. G. W.) February 1933.

Cape Province: Oudebosch (H. G. W.) January 1934.

Natal: Alexander, 1921.

Larva.—Length 20–23 mm., diameter 1.8–2 mm. Colour a warm sepia brown due to the short brown pubescence on the thick opaque integument. Form plump, terete, transversely and irregularly wrinkled.

Chaetotaxy consists of black setae of moderate length which renders them fairly conspicuous against the brown body colour. Dorsa of all segments have three setae near each postero-lateral angle, the outer seta somewhat longer than the inner pair and surrounded by a tuft of about ten stiff hairs slightly longer than the neighbouring pubescence of the integument; a single seta on the pleural region near posterior

margin; venter of all segments with a seta on either side of median line at mid-length, another seta at each postero-lateral angle sur-

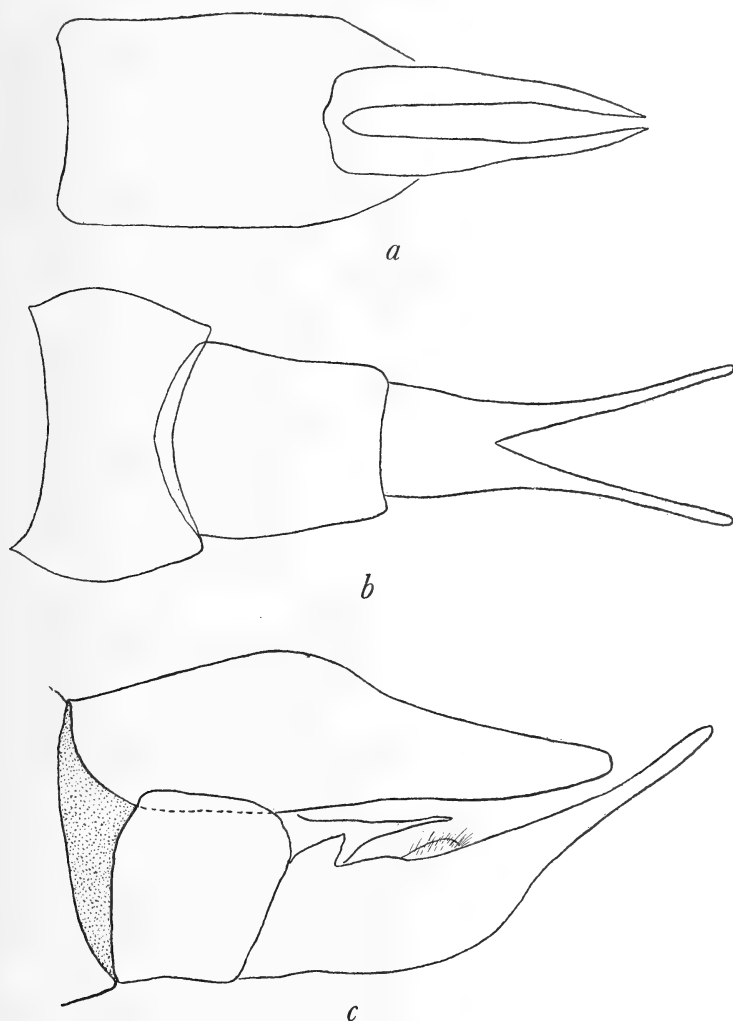


FIG. 8.—*Tipula jocosa* Alex. a, tergal valves (female ovipositor); b, sternal valves (female ovipositor); c, female ovipositor (lateral view).

rounded by a tuft of twenty stiff hairs difficult to observe against the similarly coloured body.

Spiracular disc surrounded by six lobes of equal length, tapering

to bluntly rounded apices and fringed with delicate brown hairs, which on the ventral lobes become longer along the apical margins, two large setae present on the ventral surfaces of these lobes, one mesal and one basal; inner surface of lobes with a slender median

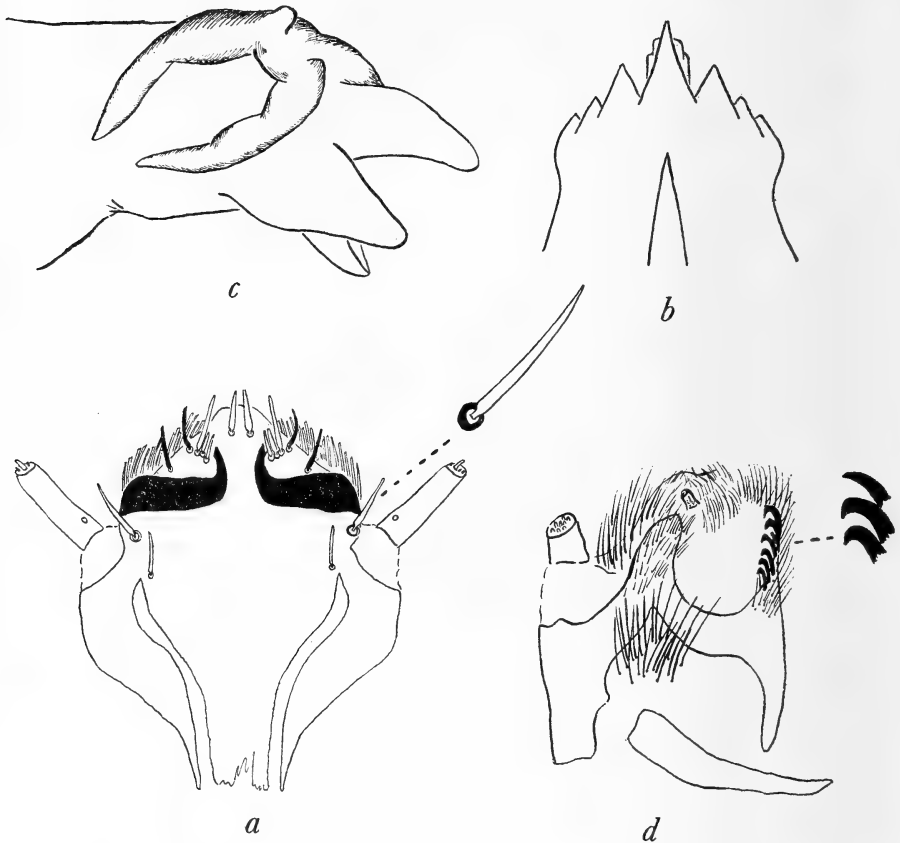


FIG. 9.—Larva of *Tipula jocosa* Alex. a, labrum and antennae (dorsal view); b, mentum; c, end of abdomen with spiracular lobes and anal gills (lateral view); d, maxilla.

stripe interrupted at one-third of its length, apical portion abruptly narrowed, then dilated into a black semicircle; dorsal lobes marked with a dusky area of brown at base of both margins, lateral lobes similarly marked on outer margin only. Spiracles large, circular, dark brown, separated by the diameter of one spiracle, outer ring large, inner portion a small dark oval; between the spiracles occur two low

semicircular blackish marks. Anal gills four, white, thus conspicuous against the brown body colour, long, curved around body surface, slender, tapering to rounded apices; each gill bears basally a small lobule, which is slightly longer on the ventral gills, being one-sixth the length of the gill.

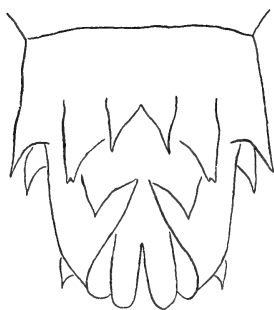
Head capsule compact, revealing the general features of the "*soror*" group, but differing in the following details: each chitinised ring on labrum (fig. 9, *a*) armed with two elongate, tuberculate setae and two adjacent setae one-half their length, and a single elongate outer seta, the margin of the ring being fringed with fifteen to twenty elongate, broad, hairlike setae; apical region of labrum pubescent with two prominent median tuberculate setae. Mentum (fig. 9, *b*) triangular in outline, almost completely divided behind, the seven anterior teeth acute, each outer tooth smaller, the inner teeth increasing in size to the large castellated acute median tooth. Maxilla (fig. 9, *d*) devoid of long tuberculate setae; inner lobe bearing short cylindrical palpus with five to seven apical sensory pegs; proximad of its base is a tuft of thirty to thirty-five delicate hairs; outer lobe clothed with a pubescence of long hairs over its entire surface, the extreme edge fringed with hairs and curved acute hairlike setae; inner apical surface having a small chitinised palpus, at apex of which are two sensory pegs.

Pupa.—Length 18–20 mm., diameter 2.6–3 mm. Similar in coloration and general features to *T. soror*, but clearly distinguishable by the male cauda (fig. 10, *e, f*) where the sheaths enclosing the ninth sternites are much reduced, just reaching the base of the posterior dorsal lobes, each ventral spine much enlarged, one-half the size of the posterior dorsal lobes, tapering to an acute apex; the four dorsal lobes of the cauda are noticeably bifid at the apices, especially from a dorsal aspect; immediately laterad of the base of each anterior dorsal lobe occur two minute acute slender spines.

♀ cauda as in *T. soror*, consequently the respective female pupae are difficult to classify until the adults have emerged.

Remarks.—The adults seem confined to those portions of mountain streams which are well shaded by trees. When disturbed, they fly rapidly to some rock or cliff face near the stream where they rest quite flat against the rock surface with the legs widespread and the wings at an angle of sixty degrees to the body. The adults are readily recognisable in the field by the vivid green coloration on the thorax and wings.

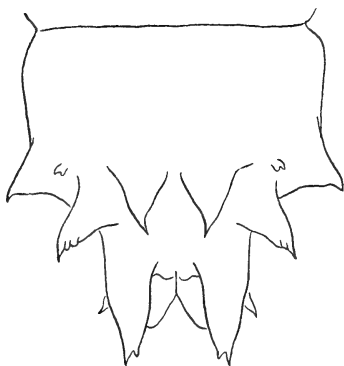
In Platteklip watercourse is a small pool six feet in diameter which



a



b



c



d



e



f

FIG. 10.—Male cauda of pupa: *Tipula soror* Wiedemann. a, dorsal view; b, lateral view. *Tipula pomposa* Bergroth. c, dorsal view; d, lateral view. *Tipula jocosa* Alex. e, dorsal view; f, lateral view.

is supplied by a constant stream of crystal clear water. On one side of the pool *Juncus* plants flourish luxuriantly and form a large dense mat four feet square and five to six inches thick. In this ideal habitat of wet soggy ooze provided by the lower portions of this mat Dr. Barnard found the larvae of *T. jocosa* feeding on the rootlets and fine organic debris surrounding them (November 1933). The larvae were covered with the greyish slime or ooze and were difficult to detect until the spiracular disc was opened out for respiration. The larvae, when fully grown, migrate away from the stream margin to the drier regions of the mat where they pupate. This stadium occupies six days.

Tipula pomposa Bergroth.

Figs. 10, *c*, *d*; 11, 12.

1888. p. 139.

1917. Alexander, p. 168, pl. xii, fig. 30 (wing); pl. xiii, fig. 52 (hypopygium); pl. xiv, fig. 60 (9th tergite).

♂: Length 19.5–20 mm., wing 21.8–23 mm. Antennae similar to those of *T. soror*, ultimate joint one-half the penultimate. Palpi with ultimate joint more whiplike, three-quarters the length of penultimate joint.

Alexander's figures of the wing and the ninth tergite given in 1917 are sound, but his sketch of the male hypopygium (fig. 52) is incorrect. The accurate portion of his description for the male hypopygium is quoted thus: "Ninth tergite broad, the caudal margin produced medially into a slender lobe whose tip is truncated with a U-shaped notch; this lobe is concave dorsally, the lateral margin being slightly elevated, the caudal margin with numerous chitinated points which continue back on the dorsal surface of the lobe for about half its length." The remainder of Alexander's description is faulty.

The outer dististyle is not "slightly elongate-oval," but in hypopygia relaxed and cleared in KOH is triangular with the basal side irregular in outline, the remaining two sides tapering gradually to a bluntly rounded apex (fig. 11, *c*). The inner dististyle is not merely "more rounded-oval," but is a complex structure. From a lateral aspect (fig. 11, *b*) this dististyle is narrow basally, then suddenly broadened; the caudal margin is rounded and beset with numerous long yellowish hairs, the apical surface giving rise to two processes, a wide high ridge (R) and a curved flattened rounded blade (B) (fig. 11, *a*), at the base of which occurs a slight protuberance with numerous fine hairs.

Penis produced into a long ventrally curved tube, three and a half times its bulbous base.

♀: Length 27–28.5 mm., wing 23.8–28.2 mm. Similar in coloration, venation and appearance to the male; ovipositor of normal tipuline structure. Legs as follows:

	I	II	III
Femur . .	12.8	13	14.4
Tibia . .	15.4	15	18
Tarsus . .	20	21	23
<hr/>			
Total . .	48.2	49	55.4

Localities.—Cape Peninsula: nil.

Cape Province: Seven Weeks Poort (K. H. B., H. G. W.), February 1932; Cango (K. H. B., H. G. W.), February 1932; Schoemans Poort (G. A. W., H. G. W.), January 1937; Oudebosch (H. G. W.), September 1933; Groendal Valley, Zwartkops River (K. H. B., C. W. T.), November 1938.

Zululand and Transvaal (Alexander); St. Lucia Bay (F. H. Power) December 1942.

Larva.—Length 50–55 mm., diameter 7–8 mm. Colour black due to the black microscopic pubescence on the opaque integument. Form plump, terete, the greatest diameter at the fifth abdominal segment.

Chaetotaxy, if present, difficult to detect against the jet-black body colour, apparently reduced to a single short seta on each thoracic pleura, replaced by groups of about twenty short black stiffened hairs distributed thus: on thoracic dorsa a transverse row of six evenly spaced groups; on venter one group near each lateral margin; abdominal segments 1–7 with two dorsal and two ventral groups, a group being situated near each postero-lateral corner of segment.

Spiracular disc (fig. 12, *a*) surrounded by six lobes of equal length, the two dorsal and the two lateral lobes narrow at base, tapering to bluntly rounded apices, the former lobes marked along inner margin with a brown stripe dilated basally, narrow apically, the latter lobes similarly striped on outer margin; the two ventral lobes broader at the base than dorsal and lateral lobes, inner surface with a dark brown mesal mark of irregular shape, apex of lobe with a short slender median stripe. Between the spiracles are two low semi-circular brown spots, each being prolonged ventrally as a thin white

band which terminates between the ventral lobes; between this white band and the outer stripe on each ventral lobe is a black oblique oval mark. Spiracles large, circular, separated by one and a half times the diameter of one spiracle, outer ring dark brown, central portion black. On the body prior to the spiracular disc occur six blunt

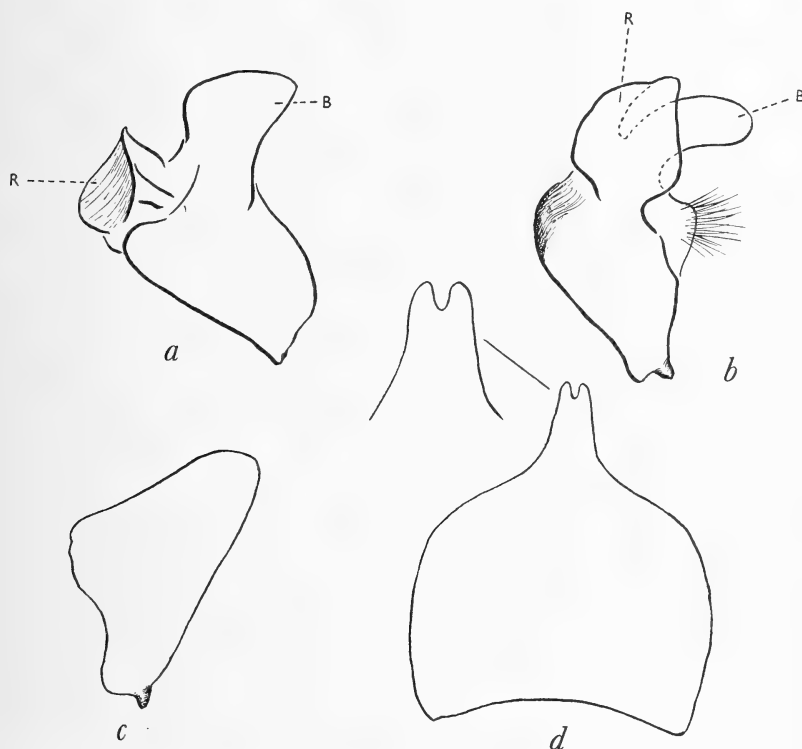


FIG. 11.—*Tipula pomposa* Bergroth. *a*, inner dististyle, male hypopygium, anterior view; *b*, lateral view; *c*, outer dististyle (male hypopygium); *d*, ninth tergite (dorsal view) with apical notch enlarged.

blackish-red protuberances, situated thus: one laterad and slightly dorsad of each lateral lobe, one between the base of this protuberance and the base of each dorsal lobe, one laterad and slightly dorsad of each ventral lobe. Anus a wide transverse slit, often dilated, the fleshy sides with a pattern of yellow and brown; laterad of each corner is a large conspicuous black wrinkled tapering anal gill which bears basally a small lobule; the two ventral anal gills are similarly shaped but the basal lobule is larger and is one-quarter the length of the gill.

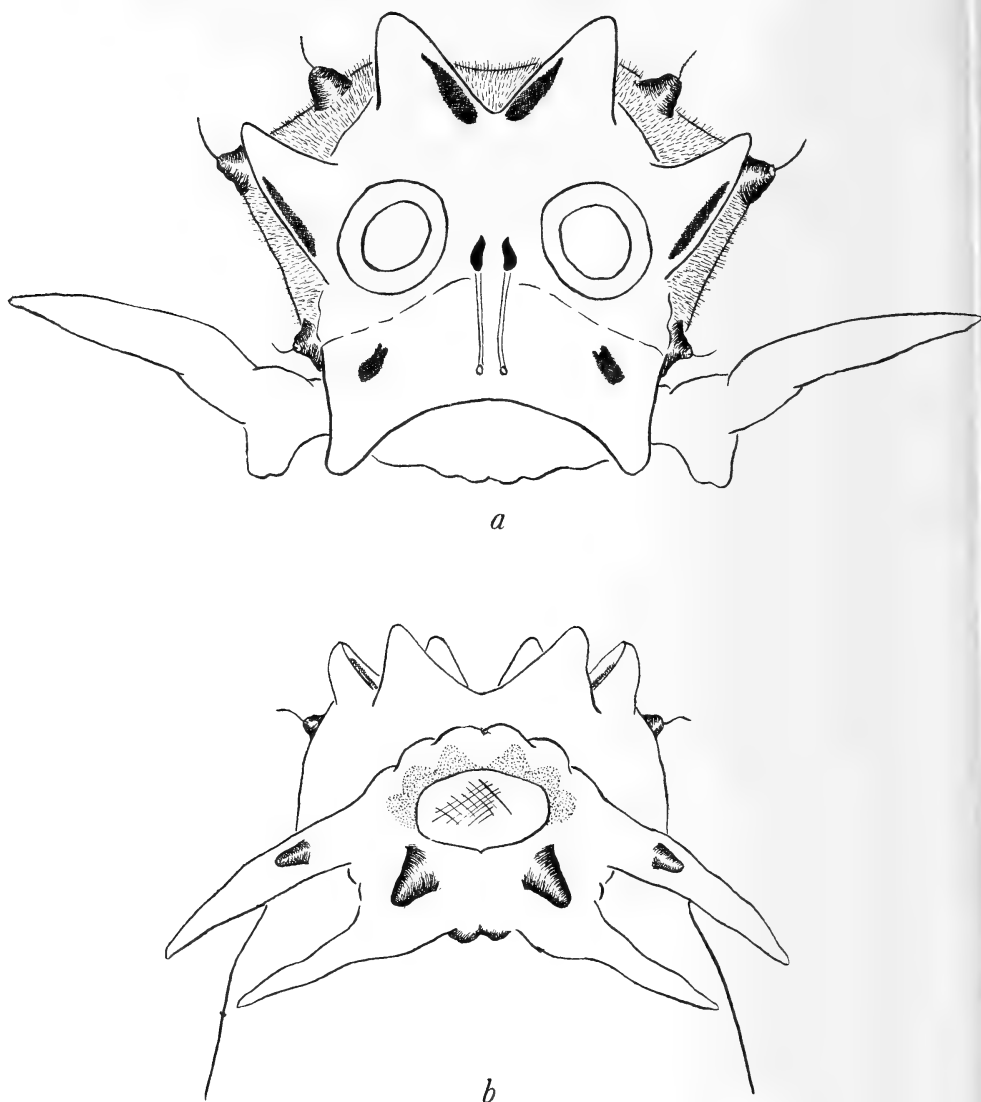


FIG. 12.—Larva of *Tipula pomposa* Bergroth. *a*, spiracular disc (posterior view); *b*, anal gills and spiracular lobes (ventral view).

Head capsule massive, revealing the typical shape and structure as in *T. soror*, the only difference being the presence of a small extra ventral cutting tooth on the mandible.

Pupa.—Length 25–31 mm., diameter 5–5.5 mm. Colour dark

brownish red to black. General shape and features as in *T. soror*, differing as follows: on either side of the transversely wrinkled mesonotum is a double rounded tubercle between each wing root and the pronotal breathing horn.

♂ cauda (fig. 10, c, d): With the armature arrangement of spines and lobes as in *T. soror*, but the dorsal lobes are much larger and more conspicuous, being slightly bifid apically, with an extra acute basal spine on the ventral surface; laterad and cephalad of the anterior dorsal lobes a small bifid lobule; the sheaths enclosing the ninth sternites of the male hypopygium are large, but are shorter than the posterior dorsal lobes and consequently conspicuously shorter than in *T. soror*; ventral hooked spine on these sheaths larger than in *T. soror*; median fingerlike lobes absent.

♀ cauda similar to that of ♀ *T. soror*.

Remarks.—In February 1932 Dr. Barnard, Mr. Thorne and the author first discovered the immatures of this species at Seven Weeks Poort. These enormous larvae of the largest crane-fly in the S.W. Cape were found in the wet sandy gravel and reddish silt on the edges of a small trickle of water two to three inches in depth, in which also occurred the immatures of *Conosia irrorata* (Wiedemann). This locality is well protected from the wind and the heat of the sun by the reeds and shrubs some five feet in height, which interlace to form a low canopy of foliage over the water. Pupation takes place in the drier portions of the low muddy bank and is of ten to twelve days duration.

At Hermitage Kloof (January 1938) Mrs. Wood and the author found three larvae and two pupae drowned in a small pool in the watercourse. The recent rains had caused the stream to become a raging torrent. It is probable that these immatures occupied the white gravelly sand along the edges of the watercourse which contains little silt or ooze.

In the field the larvae are easily distinguishable from others of the genus by their large size and peculiar anal gills.

Tipula coronata Alex.

Figs. 13–16.

1917. pp. 169–170, pl. xii, fig. 32 (wing); pl. xiii, fig. 50 (hypopygium); pl. xiv, fig. 61 (9th tergite).

1921. p. 222.

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♂: Length 8-8.7 mm., wing 9.5-11.4 mm. Antennae (fig. 13, *f*) 13-jointed, dull brown, flagellar joint 1 clavate, joints 2-4 enlarged but gradually becoming smaller than one another, semi-clavate to short-fusiform, remaining seven joints conspicuously and abruptly

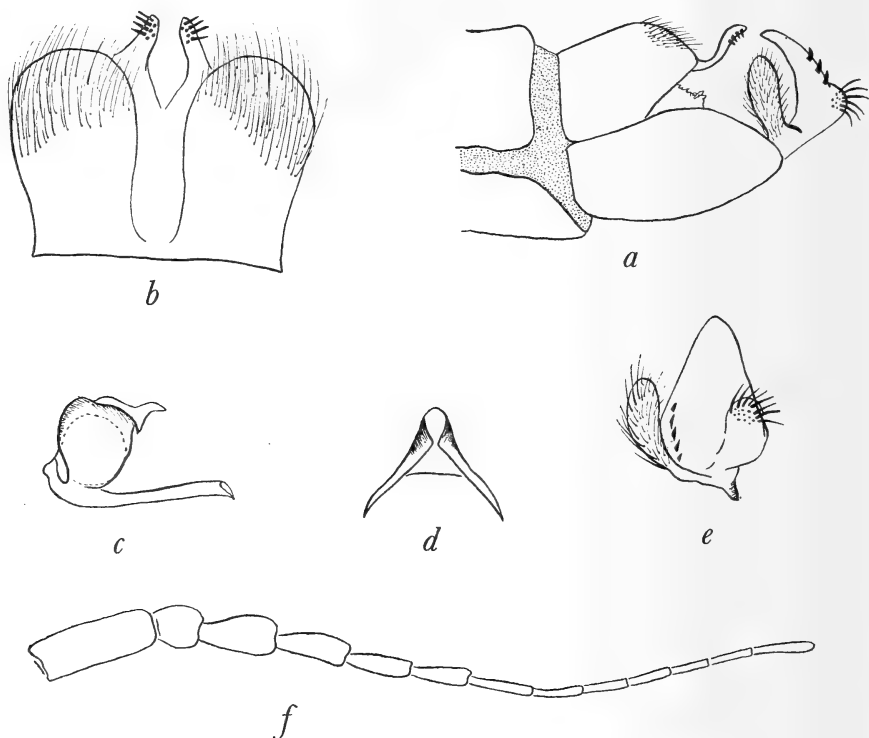


FIG. 13.—*Tipula coronata* Alex. *a*, male hypopygium (lateral view); *b*, ninth tergite (dorsal view); *c*, penis (lateral view); *d*, aedeagal sheath (dorsal view); *e*, inner and outer dististyles, male hypopygium (posterior view); *f*, antenna.

narrower and consequently threadlike in appearance, joints equal in length, slender, cylindrical, four to five times as long as broad, coloration pale yellowish brown.

"Ninth tergite subquadrate, the caudal margin with a very deep median re-entrant angle; caudal margin densely beset with powerful black bristles; margin of the U-shaped notch pale, the inner ventral angle of each of the lateral lobes produced beneath into a blunt lobule that is armed at the tip on the outer face with three stout black teeth and several powerful bristles" (see fig. 13, *a*).

Alexander in the remainder of his description of the male hypopygium (p. 170 and in his fig. 50) failed to note the presence of the fleshy outer dististyle and consequently described only the inner dististyle ("pleural appendage").

Basistyle small and inconspicuous; outer dististyle (fig. 13, *e*) a fleshy pubescent lobe, spatulate in outline; inner dististyle (fig. 13, *a, e*) triangular when viewed posteriorly, its outer basal margin armed with a row of six short, stout equidistantly spaced spines; from a lateral aspect this lobe is broad at base, tapering to a slightly hooked slender apex, outer basal angle rounded, slightly produced, knoblike, bearing twenty to thirty stout, armed, setalike hairs. Penis short (fig. 13, *c*), only twice the length of its bulbous base, which is enclosed by the cup-shaped aedeagus with its "latera" and "basum"; ninth sternite extensive, deeply incised on the mid-ventral line, at the base of which is the short, chitinised aedeagal sheath (fig. 13, *d*) attached by a short, tapering strip of membrane to either side of the incision.

♀: Length (newly emerged) 8–9 mm., (gravid) 15.5 mm.; greatest diameter of abdomen 3 mm. Subapterous; young females have the abdomen of normal length and width, and reveal a similar coloration to that of the males. Gravid females dark reddish brown, almost black, unicolourous on praescutum, abdomen enormously swollen and greatly extended, containing on an average 320 to 350 black eggs which are visible through the stretched segments of the abdomen. Palpi (fig. 14, *b*) have the ultimate joint one and a half to one and three-quarter times the length of penultimate, this joint consequently not as whiplike as in the typical members of the genus (fig. 7, *a*). Antennae (fig. 14, *c*) 13-jointed; flagellar joint 1 enlarged, clavate, twice as long as its broadest diameter; joints 2–3 equal in length, semi-clavate, twice as long as broad; joints 4–5 less wide, about equal in length, short-fusiform; joints 6–9 equal in length to joint 5 but slightly narrower, three times as long as broad, slightly fusiform, penultimate joint swollen apically, twice as long as ultimate joint, which is small and conical. Distal to the fifth flagellar joint the female antennae differ markedly from those of the male (*cf.* fig. 13, *f*).

Wings (fig. 14, *d*) one and a quarter times the length of a halter, gradually swelling from the base to a wide rounded apex; costal margin almost straight; anal angle suffused with light brown, basal portion with five macrotrichia; venation reduced to a straight radial vein bearing five mesal and seven to eight apical macrotrichia, and vein M with five macrotrichia along mid length, costal margin with numerous macrotrichia.

Halteres (fig. 14, *a*) almost straight, slender, slightly dilated basally; knob small, oval, twice the width of halter stem. Legs long and slender for a subapterous female, fore femora not incrassate.

	I	II	III
Femur . . .	5	5.5	5.5
Tibia . . .	5.8	4.5	6.2
Tarsus . . .	12.2	9.2	9.6
<hr/>			
Total . . .	23	19.2	21.3

Abdomen enormously swollen and packed with black eggs; ninth sternite large, underlying the ninth tergite and the short telescoped tenth tergite; ovipositor (fig. 14, *g*) unusual in form and structure; thus these females (and those of *T. caffra*) are easily distinguishable from the subapterous females of the genus *Longurio*. Dorsal valve subdivided into two valvelets, one above the other, the caudal margin of each being rounded and indentate medially; anus heavily chitinated and opening through the membranous tissue at the base of the dorsal ovipositor valve (fig. 14, *e*); tenth sternite large, heavily chitinated, pubescent, concealed when viewed from a dorsal aspect, the short slender valves at apex form a deep median groove or furrow for the emission of the eggs, the sides being chitinated and clothed with numerous stiff black setae.

Localities.—Cape Peninsula: Orangezicht (K. H. B.), May 1931; Echo Valley (K. H. B., H. G. W.), April 1931; Red Gods (K. H. B., C. W. T.), April 1937; Grotto (K. H. B., H. G. W.), May 1931; Chapmans Peak (G. A. W., H. G. W.), May 1934.

Cape Province: Seven Weeks Poort Berg (K. H. B.), December 1928; Fonteintjiesberg (K. H. B.), March 1929; Ruiterbosch (K. H. B., H. G. W.), February 1932; Meirings Poort Berg (K. H. B., H. G. W.), February 1932; Zebasberg (Stokoe), April 1933; Slanghoek Peak (K. H. B.), March 1938; Palmiet River (K. H. B., C. W. T.), April 1936; Waaihoek Kloof (K. H. B.), April 1928; French Hoek Pass (G. A. W., H. G. W.), April 1935.

Larva.—Length 15–17 mm., diameter 3–3.5 mm. Colour dull cream to yellowish brown, often dark brown. Form very plump, the greatest diameter about third abdominal segment; integument opaque,

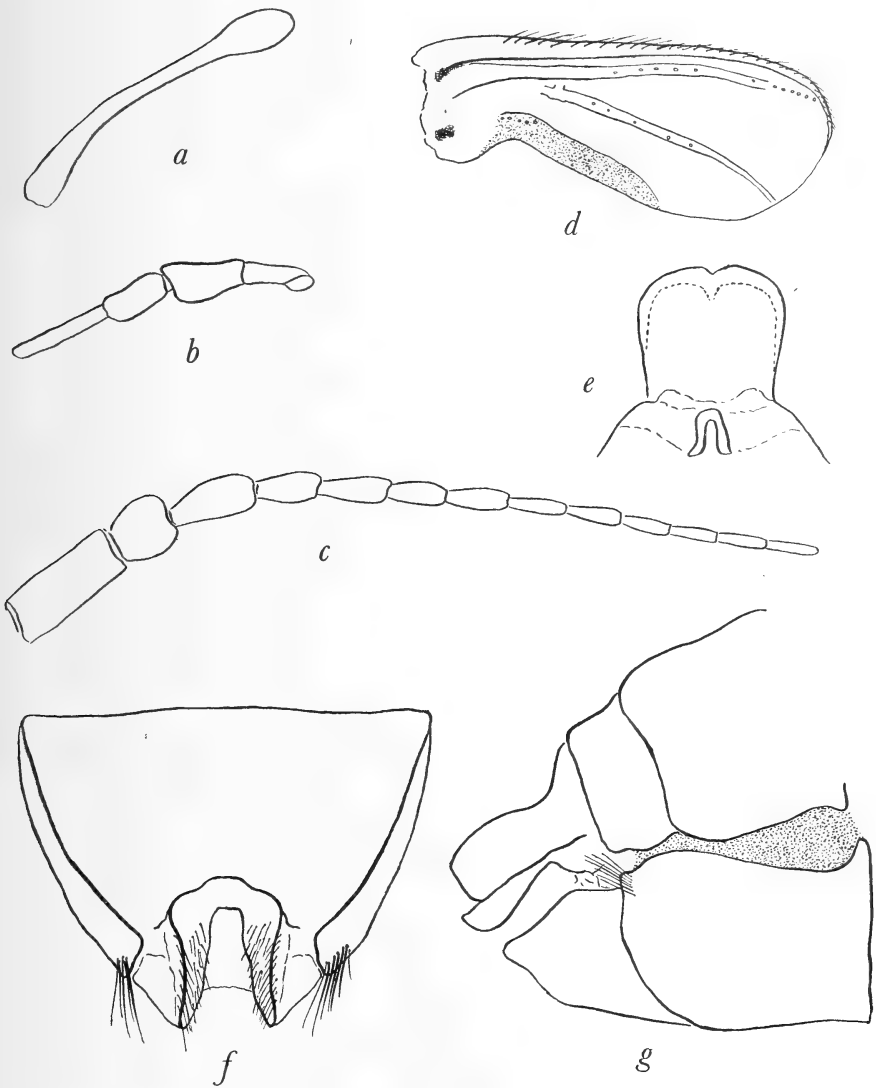


FIG. 14.—*Tipula coronata* Alex. Female: *a*, halter; *b*, maxillary palpus; *c*, antenna; *d*, wing; *e*, tergal valves of ovipositor (ventral view); *f*, sternal valves of ovipositor (dorsal view); *g*, end of abdomen (lateral view).

covered with microscopic pubescence to which adhere persistently minute grains of soil; each abdominal segment wrinkled into three transverse folds or annuli.

Chaetotaxy consists of very short, stiff, brown setae, the tips of which just emerge from the thin layer of soil on the integument, consequently difficult to detect at first. Dorsum of prothorax with a row of eight setae along the anterior and posterior margin, pleura with four setae, an anterior group of three and a mesal seta, venter with an anterior and a posterior row of four setae; remaining segments of thorax and abdominal segments 1-7 with eight dorsal, two pleural and eight ventral setae, all of which form a continuous posterior row round the segment, the pleural setae on the abdominal segments situated on a large conspicuous fleshy protuberance.

Spiracular disc (fig. 15, *d*) surrounded by six short lobes which are relatively much shorter than those of the "*soror*" group; ventral lobes the largest, in the shape of an equilateral triangle, the inner surface entirely darkened with brown, a stout elongate apical seta present; dorsal and lateral lobes stout and wide at base, then suddenly narrowed to slender acute outwardly curved apices; cephalad of each lateral lobe a stout seta; inner surfaces of these lobes devoid of markings; spiracles large, circular, separated by the diameter of one spiracle, outer ring light brown, inner region black. Anal gills absent, the actual anus often blown out and distended, colour dirty white to yellowish; along the ventral margin of the anus a row of four short tuberculate setae.

Head capsule broad, compact, massive, revealing the general features of the genus, but differing distinctly from the "*soror*" group in the following details: labrum (fig. 15, *b*) large, broad, having two chitinised areas near apex, each ring armed with an outer and two inner elongate spear-shaped tuberculate setae, cephalad of inner pair of setae a single elongate seta, margin of labrum fringed with numerous hairlike setae; along base of antenna occur two much-elongated tuberculate setae. Antenna (fig. 15, *b*) with basal segment as long as broad, apical papilla twice as long as its basal diameter, conical, sculptured basally, surrounded by four to five sensory papillae. Maxilla (fig. 15, *c*): cardo a slender tapering rod, armed with two much-elongated tuberculate setae at inner angle; inner lobe bearing a short cylindrical palpus with several sensory papillae at its apex, distad of this palpus a large spear-shaped seta, outer lobe armed with two elongate setae, inner twice as large as the outer, apical area of lobe fringed with numerous setalike hairs. Hypopharynx (fig. 15, *a*)

with three anterior teeth, middle tooth small and rounded, outer teeth larger, tapering to irregular shaped apices.

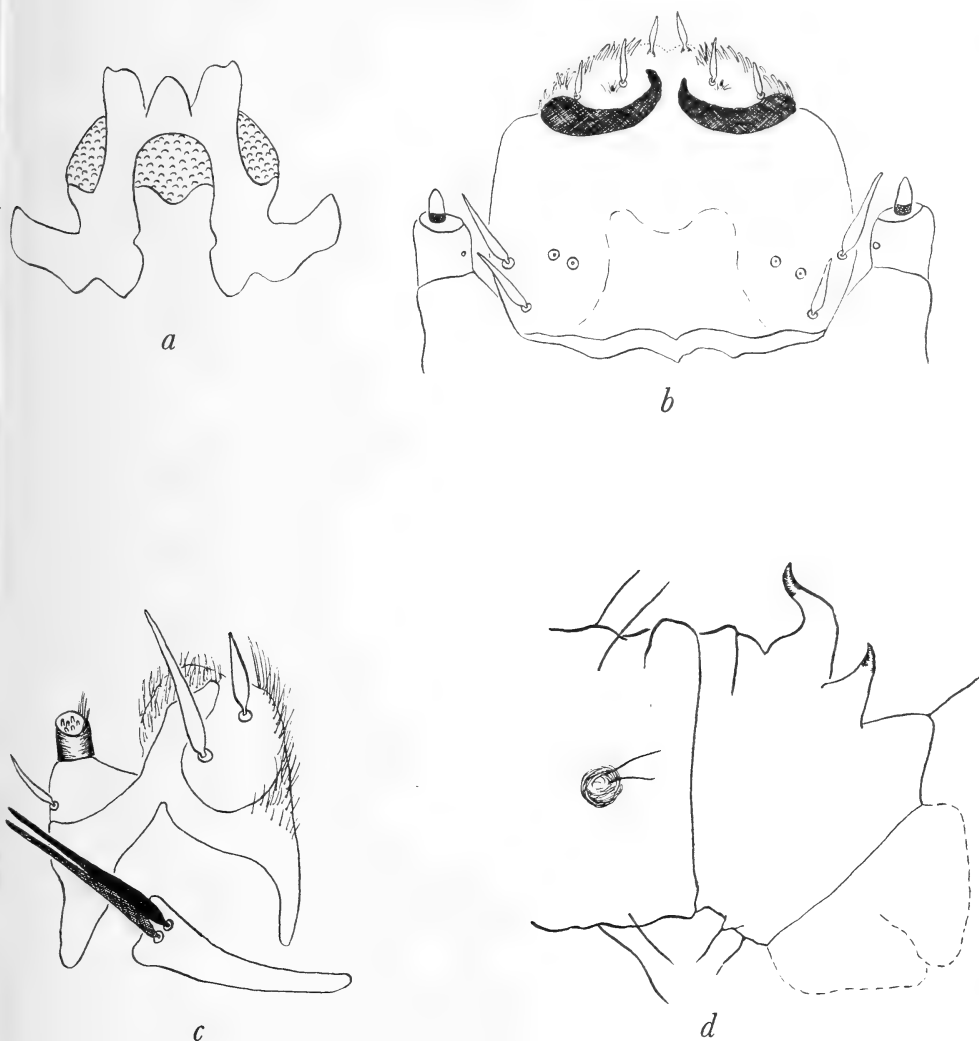


FIG. 15.—Larva of *Tipula coronata* Alex. *a*, hypopharynx and prementum; *b*, labrum and antennae (dorsal view); *c*, maxilla; *d*, end of abdomen (lateral view).

Pupa.—Length 13–16 mm., diameter 2–2.8 mm. Similar in colour and general appearance to *T. caffra*, differing as follows: cephalic crest not as large, consisting of a stout, moderately long median lobe

(fig. 16, *a*), bifid (ventral aspect), the incision deep; (lateral aspect) the crest very wide, dorsal margin strongly curved to a minute spinous apex (fig. 16, *b*).

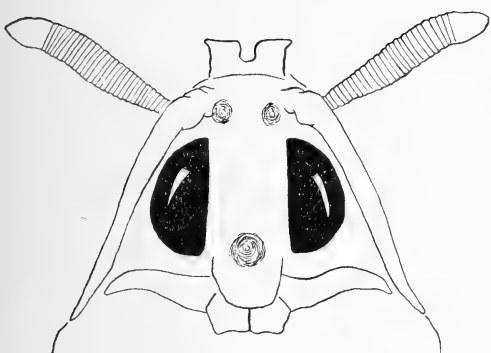
Pronotal breathing horns moderately long, elongate-clavate, directed laterally, equal in length, margins crenulate (fig. 16, *a*, *b*). Dorsa of abdominal segments 2–6 as in *T. caffra*, of segment 7 with only one small spine on each postero-lateral angle; venter armed only on abdominal segments 6–7 with five inconspicuous and seven large spines respectively.

♂ cauda (fig. 16, *c*, *d*): Anterior dorsal lobes large and prominent, tapering gradually to slender chitinised apices, posterior dorsal lobes much smaller, being bulbous and abruptly narrowed to short acute apices; sheaths of ninth sternites large, rounded, ventral spine much enlarged and conspicuous, projecting far beyond the tip of posterior dorsal lobes; eighth segment of cauda armed with two dorso-medial and two large lateral lobelike spines, closely placed together, curving to acute apices; ventral spines absent.

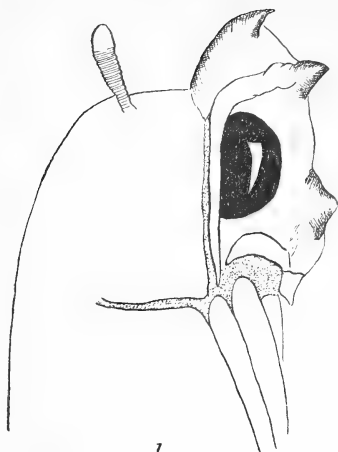
♀ cauda (fig. 16, *e*, *f*): Actual armature as in male, but apex of cauda practically truncate, consequently the two anterior dorsal lobes, the two dorso-medial spines and the lateral spines form a dorsal ring around the bulbous posterior dorsal lobes; tergal sheaths of ovipositor absent, sternal sheaths large, rounded; ventral spines present, conspicuous; apices acute.

Remarks.—Male imagos of this species have been recorded from a large number of localities in the Cape Peninsula and Province and occur chiefly on open mountain slopes.

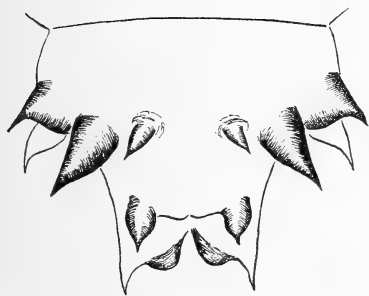
In May 1936 the allotype female was bred by Mr. Thorne from larvae collected at Palmiet River. For three years previous to this date Dr. Barnard, Mr. Thorne and the author had searched persistently and unsuccessfully for the immature stages of this species on Table Mountain. The presence of the winged males on the *Restio* clumps and the knowledge of the breeding locality of members of the closely allied *Longurio* genus confined the search to the dry soil at the base of the *Restio* clumps. The females are physogastric and subapterous and, as they are eagerly sought after by the winged males in their unceasing activity, seem loath to move far afield. The eggs are laid within a small radius in the shelter of a *Restio* clump. The consequent larvae burrow downwards to a depth of nine to twelve inches, feeding on the rootlets of the *Restio* and congregating where most food is available. In the light of these facts the formidable difficulty of the search, namely, finding the correct *Restio* clumps on our vast mountain



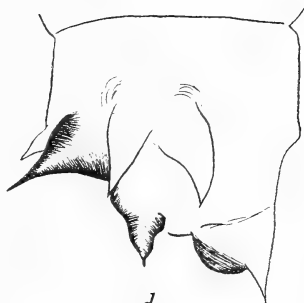
a



b



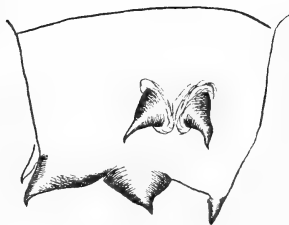
c



d



e



f

FIG. 16.—Pupa of *Tipula coronata* Alex. *a*, head (ventral view); *b*, head (lateral view); *c*, male cauda (dorsal view); *d*, male cauda (lateral view); *e*, female cauda (dorsal view); *f*, female cauda (lateral view).

slopes, can be realised. Eventually, at Palmiet River the labours of Dr. Barnard and Mr. Thorne were rewarded by the discovery of several larvae which proved to be *T. coronata*. These were found at the base of *Restio* clumps which skirt the open boulder-strewn banks of the river. Prior to pupation the fully grown larvae burrow upwards and rest, protected by the *Restio* clump, just beneath the surface of the soil. The duration of the pupal stage is nineteen days. After the emergence of the adult fly the pupal "shuck" is left protruding from the soil.

In April 1937, on Table Mountain, a further search by Dr. Barnard and Mr. Thorne for the immatures of this species proved successful, numerous larvae and pupae being collected and bred. The females bred are easily distinguished from the subapterous *Longurio* females by the possession of an unusual form of ovipositor (fig. 14, *g*). The slender abdomen of newly emerged females rapidly becomes enormously swollen as the ovaries produce their 320 to 350 black eggs.

Tipula caffra Alex.

Figs. 17-19.

1917. pp. 171-172, pl. xii, fig. 33 (wing).

The description of the holotype male and the figure of wing by Alexander are excellent. The value of the description of the male hypopygium is considerably lessened by the lack of suitable figures. Alexander states: "ninth tergite extensive, profoundly incised medially by a V-shaped notch, this cut extending about to the eighth segment, so that the ninth tergite, viewed from above, is completely divided into two lobes, each lobe triangular, the apex subacute."

Fig. 17, *b*, illustrates the ninth tergite. Basistyle wide, truncate at apex. The usual fleshy pubescent outer dististyle found in all the other species of *Tipula* in the S.W. Cape is absent, thus only one dististyle articulates from the mesal face of each basistyle. This fact and also the actual structure of the dististyle are of vast specific importance and such loosely worded phrases as "appendages yellow, simple in structure" (Alexander, 1917, p. 171), especially when no accompanying figure is given, are of little value.

The dististyle (fig. 17, *c*) is simple when contrasted with the inner dististyle of *T. soror* and *T. pomposa*, and is a pubescent structure, stout and broad at base, tapering gradually to a hooked chitinised apex, outer mesal region bearing a small fleshy protuberance, unarmed,

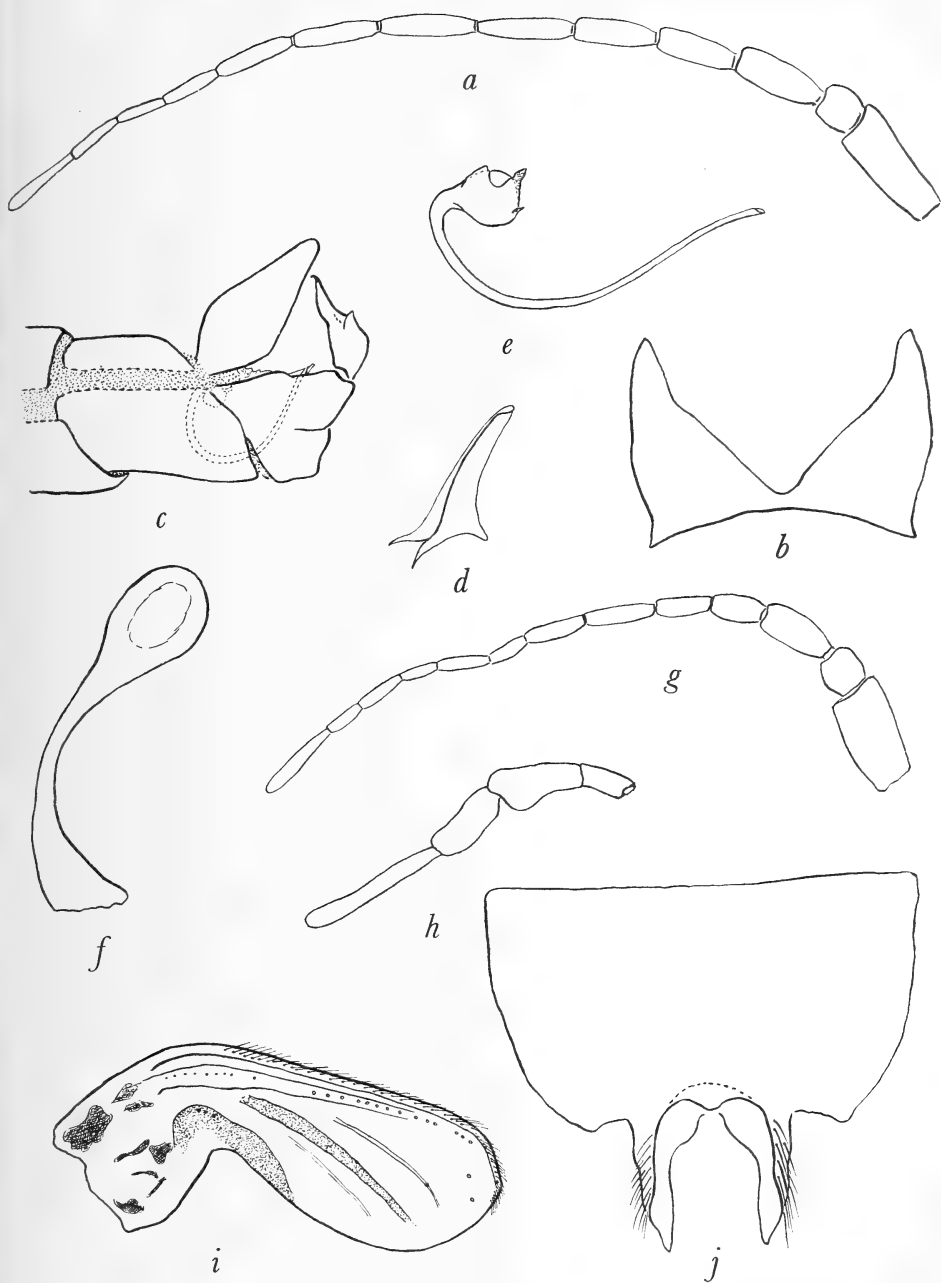


FIG. 17.—*Tipula caffra* Alex. *a*, male antenna; *b*, ninth tergite (dorsal view); *c*, end of abdomen (lateral view); *d*, aedeagal sheath (lateral view); *e*, penis (lateral view); *f*, female halter; *g*, female antenna; *h*, female maxillary palpus; *i*, female wing; *j*, sternal valves of ovipositor (dorsal view).

but pubescent. Penis (fig. 17, e) an elongate tube, five and a half to six times its bulbous base, aedeagal sheath of moderate length (fig. 17, d).

♀: Length 10–11 mm. Subapterous, physogastric. Young females have a coloration similar to the males, but the praescutal stripes are absent; gravid females are dark reddish brown, almost black, unicolourous on praescutum. Ultimate joint of palpi (fig. 17, b) twice the penultimate. Antennae (fig. 17, g) 13-jointed; flagellar joint 1 cylindrical, three times as long as broad; joint 2 subglobular, one-half the length of previous joint; joints 3–6 equal, cylindrical, two and a half to three times as long as broad, slightly fusiform; joints 7–10 cylindrical, equal, clearly shorter than joint 6; ultimate joint twice the penultimate, elongate, cylindrical, slightly dilated at rounded apex; antennae are shorter than those of the males and consequently their general shape and appearance differs from that of the males.

Wings (fig. 17, i) one and a quarter the length of a halter, costal margin curved strongly for one-third its length, the wings consequently strongly restricted and bent at this region, thereafter swelling to a wide rounded apex; anal angle and vein M suffused with light brown, the former having three basal macrotrichia; costal margin fringed with numerous delicate hairs for its entire length, radial vein prominent, bearing nine basal, eight mesal and six apical macrotrichia; traces of veins Cu and R_{4+5} occur in majority of females. Halteres (fig. 17, f) conspicuously curved, slender, much dilated basally, knob large, three and a half to four times the width of the stem. Legs short, thus differing vastly from those of female *T. coronata*.

		I	II	III
Femur	.	4	3	2
Tibia	.	3.5	3	3
Tarsus	.	4.5	4.5	5
Total	.	12	10.5	10

Abdomen of gravid females packed with black eggs, consequently much dilated; terminal sclerites and ovipositor similar in arrangement to the female of *T. coronata*, except that the apical valves of the sternite are longer and form a deeper median groove or furrow (fig. 17, j).

Localities.—Cape Peninsula: Fernwood (C. W. T.), May 1935.

Cape Province: Sneeuwgat Valley (Lightfoot), April 1916; French Hoek Pass (H. G. W.), April 1935.

Larva.—Length 24 mm., diameter 3–5 mm. Colour dull dirty fawn, thoracic segments dirty white. Form plump, terete, greatest diameter about the second abdominal segment; integument thin, revealing the underlying muscles and alimentary system, devoid of fine hairs.

Chaetotaxy composed of stiff setae of moderate length. Dorsum of prothorax with six setae along anterior margin and a transverse row of eight evenly spaced setae near posterior margin; pleura with three setae, one anterior and two posterior; venter with an anterior and posterior row of four longer setae; meso- and metathorax with anterior row of four pairs of setae, each outer seta elongate, three times the inner; pleura with two anterior pairs of equal setae; venter with mesal row of four single evenly spaced setae; dorsa of abdominal segments 1–7 have a transverse row of setae near posterior margin, consisting of four evenly spaced setae, laterad and slightly cephalad of each outer seta an additional pair of setae, the inner five times the outer; pleura with a mesal and a pair of posterior setae; venter with four evenly spaced pairs of setae, each outer pair slightly caudad of the inner pair; four setae along ventral lip of anus.

Spiracular disc (fig. 18, *d*) apparently lobeless at first, closer examination reveals six minute fleshy lobelets, the dorsal pair mere tubercles for bearing the elongate brownish setae, lateral and ventral lobes distinct, conical, each bearing an apical seta, cephalad of each lateral lobe a single long seta, laterad a pair of short setae; spiracles large, circular, separated by twice the diameter of one spiracle; spiracular area devoid of markings. Anal gills absent, anus a wide transverse slit, the surrounding area frequently distended as in *Longurio*.

Head capsule compact and massive, revealing the general features of *T. coronata* with the following minor specific differences: labrum (fig. 18, *a*) a narrow transverse plate at apex of which occur two chitinated areas, each ring armed with an elongate spear-shaped tuberculate seta; in each corner laterad of the outer seta is a set of five hairlike marginal setae; cephalad of the inner seta another shorter tuberculate seta; along base of antennae occur three much-elongated tuberculate setae. Antennae (fig. 18, *a*) with basal segment twice as long as its broadest diameter, rounded at outer apical margin; apical papilla large and conspicuous, two and a half times as long as its basal diameter, conical, surrounded by four to five sensory papillae; auditory disc at mid-length. Hypopharynx (fig. 18, *b*) with five anterior teeth; middle tooth large, rounded; inner teeth

smaller, rounded; outer teeth reduced, acute. Maxilla (fig. 18, c) similarly haired to that of *T. coronata*, possessing these additional



FIG. 18.—Larva of *Tipula caffra* Alex. a, labrum and antennae (dorsal view); b, hypopharynx; c, maxilla; d, end of abdomen (dorsal view) with spiracular disc.

setae: inner lobe with a single seta at inner basal angle of palpus and three setae below the outer angle of the membranous tissue

supporting the palpus; outer lobe with three loose tuberculate setae in its extreme edge; outer basal region with a tuft of seven to ten large acute setae.

Pupa.—Length 11–15 mm., diameter 2–3 mm. Coloration pale golden yellow; thorax deep orange with dark yellowish brown to dark brown; wing pads, abdominal incisures and pleural region pale sulphur yellow; cauda and tips of breathing horns heavily chitinised. Form moderately slender. Cephalic crest (fig. 19, *a*) very prominent, consisting of stout, wide chitinised median lobe, each outer apical angle produced into a thick blunt hook (ventral aspect); crest wide and stout at base, tapering to an acute ventrally curved apex (lateral aspect—fig. 19, *b*); antennal sheath (fig. 19, *a*) slender, tapering to wing angle, base irregular, prolonged into a large, pointed, ventrally directed, chitinised lobe; labrum (fig. 19, *a*) with a prominent chitinised lobe situated on median line, tapering to a subacute apex; actual labrum broad, pointed apically; labial lobes oval, outer angle often slightly produced, inner margins contiguous; maxillary palpi (fig. 19, *a*) strongly curved but not recurved at tips, tapering to slender apices.

Pronotal breathing horns slender, elongate, very large for this small pupa, equal in length, directed outwards and forwards (fig 19, *a, b*), curved from a lateral aspect, margins crenulate, apices slightly dilated. Wing pads extend to end of abdominal segment 2; leg sheaths of equal length in female, extending to end of abdominal segment 3, in male greatly elongated; fore tarsi extending to end of abdominal segment 6; mid tarsi opposite end of anterior annulus of segment 7; hind tarsi reaching middle of cauda.

Abdomen slightly flattened dorso-ventrally; pleura often crenulate and carinate; abdominal segments 2–7 subdivided into two annuli; posterior annulus somewhat longer than the anterior, each anterior annulus devoid of spines or setae except in the pleural region where there occurs a long, slender, acute spine at mid-length; posterior annuli (fig. 19, *a*) armed with stout, acute spines as follows: dorsa of segments 2–7 with a transverse row of 22, 26, 26, 16, 13, 9 spines; pleura of segments 2–7 with two closely placed spines, cephalad of which is the minute respiratory spiracle; venter of segment 4 bare, of segments 5–7 with 7, 9, 8 spines, which are much longer and more slender than the dorsal spines, several becoming almost setalike at their apices.

♂ cauda (fig. 19, *d, f*): Armed with four powerful dorsal lobes, the anterior lobes smaller than the posterior lobes, tapering to acicular

chitinised apices; smaller lobes wide at base, almost truncate apically (dorsal view—fig. 19, *d*), each outer angle further prolonged into an acute spine; sheaths enclosing ninth sternites large and rounded, practically as long as posterior dorsal lobes; ventral spine much

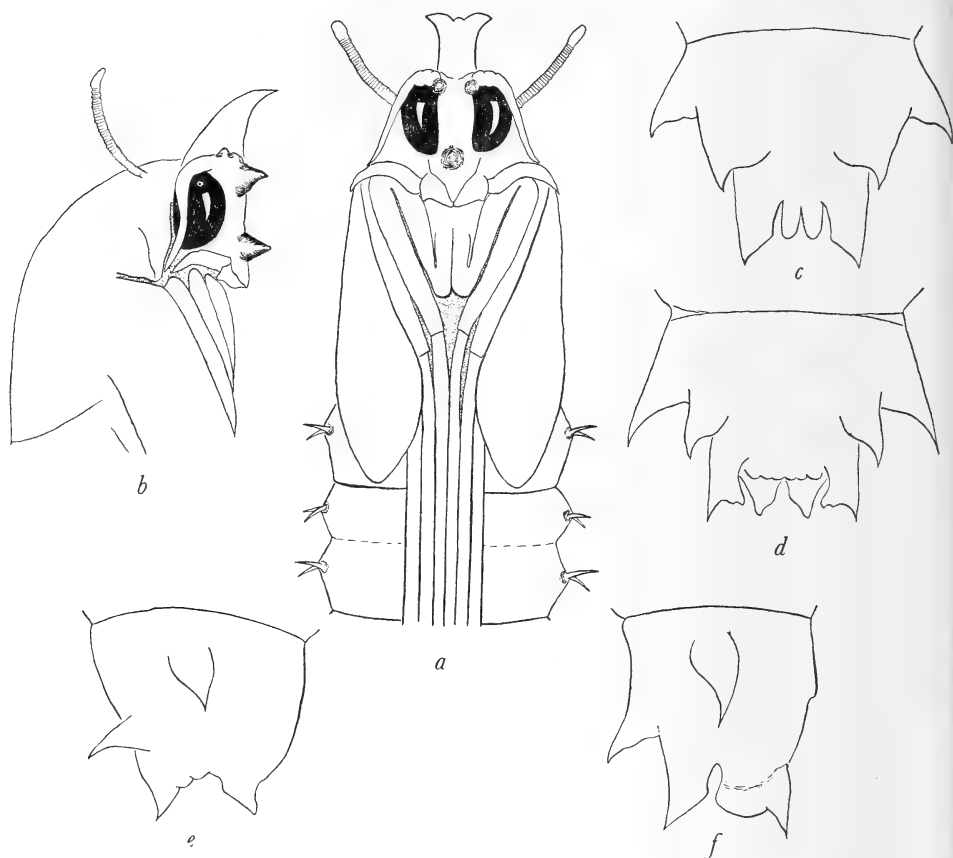


FIG. 19.—Pupa of *Tipula caffra* Alex. *a*, anterior portion (ventral view); *b*, ditto (lateral view); *c*, female cauda (dorsal view); *d*, male cauda (dorsal view); *e*, female cauda (lateral view); *f*, male cauda (lateral view).

enlarged and conspicuous, clearly visible from lateral aspect (fig. 19, *f*), scarcely projecting beyond tip of posterior dorsal lobes; eighth segment of cauda unarmed except for a prominent pleural spine, wide at base, tapering to an acicular apex, considerably larger than anterior dorsal lobes. This lack of armature on the eighth segment readily distinguishes these pupae from those of the “*soror*” group.

♀ cauda (fig. 19, c, e): Similar to that of male, usual sheaths of ovipositor absent, sternal sheaths large and stout at base, tapering suddenly to acute apex, inner surface markedly oblique; ventral spines absent.

Remarks.—The adults and immatures of this species were first found on the Cape Peninsula by Mr. Thorne. The larvae and pupae occur in the rich dry soil of Fernwood Ravine, the former burrowing to a depth of six to nine inches below the surface of the ground, which is covered by a thick carpet of rotting leaves.

The late Mr. R. M. Lightfoot collected two adults at Sneeuwgat Valley in April 1916. This elevated valley (3600 feet) has the *Restio* and scrubby vegetation so typical of the S.W. Cape mountains. It is probable that in this situation the larvae and pupae live in the soil at the base of the *Restio* clumps as do the immatures of *Tipula coronata* and several species of the closely allied genus *Longurio*.

The immatures of *T. coronata* and *T. caffra* closely resemble those of the genus *Longurio*, the larvae in the reduction of the size of the spiracular lobes and the lack of anal gills, the pupae in the high cephalic crest. This tendency towards similarity is probably due to the environmental factors, for the forms of both genera frequent the same *Restio* clumps, share the same food and react to the same humidity of the soil.

Genus NEPHROTOMA Meigen.

1803. p. 262.

1834. Macquart, p. 88 (*Pachyrina*), p. 89 (*Pachyrina*).

Imago.—Males and females normally winged; body coloration orange and jet black; nasus prominent, not bifid; terminal joint of maxillary palpi elongate, whiplike, approximately four to six times the length of penultimate joint; antennae 13-jointed, elongate in males, shorter in females; wings with RS short, usually less than m-cu; vein R_{1+2} preserved (Alexander, 1917, fig. 41); cell M_1 short-petiolate, usually sessile, 1st M_2 present; Sc_1 atrophied, Sc_2 enters Sc immediately adjacent to origin of RS; male hypopygium with caudal margin of ninth tergite concave, median portion notched but never produced to form a lobe; two dististyles articulate with each basistyle, outer a fleshy conspicuous flattened blade, usually tapering to an acute or subacute apex, inner dististyle a slightly concave blade, apex curved dorsally to a hook, outer margin carinate and

membranous, basal margin produced into a low ridge; female ovipositor with acicular valves, never reduced or fleshy.

Larva.—Form plump, terete; chaetotaxy composed of stiff setae, often tuberculate on abdominal pleura 4-7. Spiracular disc surrounded by six lobes. Head capsule retractile, massive. Antennae twice as long as broad, apical papilla reduced. Mandible with apical tooth and a single ventral cutting tooth. Hypopharynx with five teeth, mentum with seven teeth. Prementum fleshy with microscopic setae. Labrum and maxilla as in genus *Tipula*. Anal gills two or absent.

Pupa.—Cephalic crest absent. Sheaths of maxillary palpi strongly recurved. Pronotal breathing horns elongate, conspicuous, apices dilated (lateral aspect). Each abdominal segment with a transverse row of spines. Male cauda with minute tergal sheaths, sternal sheaths large, conspicuous; female cauda with tergal sheaths very large, longer than prominent sternal sheaths; eighth segment with four dorsal, one pleural on either side and two ventral lobes.

The numerous species of this genus which occur throughout South Africa reveal a striking uniformity in size and colour but vary considerably in the structure and length of the male antennae. The male hypopygium, which is in other genera so useful in classification, is remarkably uniform and reveals only minor specific differences. The species comprising this genus are not well understood, as the majority of holotypes are solitary females, which differ considerably from the males. Careful breeding of adult flies from larvae, and an abundance of specimens collected *in copula* in the field, will gradually correlate the sexes and reduce many of the difficulties which now exist in classifying the various species.

The life-histories of two of the three species frequenting the S.W. Cape have been worked out and are herein described. The immatures of both species occur in the fertile, moist top layer of the soil in forest areas and also the relatively dry soil beneath *Restio* clumps on mountain slopes and plateaus.

Key to Species of Nephrotoma.

Imagos.

1. Antennae of male elongate, four and a half or eight times the length of head and rostrum; if bent backwards, extending to end of abdominal segment 3; point of contact between Cu₁ and M₃ beneath cell 1st M₂ 2.

Antennae of male moderately elongate, three and a half times the length of head and rostrum; if bent backwards, extending to base of abdomen; point of contact of Cu_1 before origin of M_3 by a distance subequal to basal deflection of R_{4+5} *petiolata*.

2. In male and female postnotum light yellow with dark brown median stripe; apical hook of inner dististyle (fig. 20, *e*) acute; penis moderately long (fig. 20, *a*), five times as long as basal portion *antennata*.

Male and female without postnotal stripe; apical hook of inner dististyle (fig. 24, *d*) bluntly rounded, wide; penis (fig. 24, *b*) elongate, six times as long as basal portion *umbripennis*.

Larvae.

No anal gills; pleural protuberances on segments 4-7 . . . *antennata*.

An anal gill on either side of anus; no pleural protuberances . . . *petiolata*.

Pupae.

Male antennal sheath extending to end of abdominal segment 1 . . . *antennata*.

Male antennal sheath extends to end of thorax . . . *petiolata*.

Nephrotoma antennata (Wiedemann)

Fig. 20-22.

1821. p. 53 (*Tipula*); 1828. p. 53 (*Tipula*).

1888. Bergroth, p. 140 (*Pachyrrhina*).

1917. Alexander, p. 177, pl. xii, fig. 38 (wing); pl. xiv, fig. 64 (9th tergite) (*Nephrotoma*).

Length 12-13.5 mm., wing 13-13.5 mm. Head orange-yellow; eyes jet black; nasus prominent but not bifid, light brown clothed with short, coarse, black hairs; dark brown occipital mark forming a narrow elongate triangle, apex of which is slightly produced to base of low frontal tubercle; palpi dark brown, ultimate joint yellowish, elongate, six times the length of penultimate joint; antennae (fig. 20, *h*) 13-jointed, conspicuously elongate, four and a half to four and two-thirds as long as the combined head and rostrum—if bent backwards, extending to end of third abdominal segment; flagellar joint 1 orange-yellow, elongate, seven to eight times its broadest diameter, one and three-fifths the combined scape, incised slightly at mid-length but basal swelling missing, remainder of flagellum dark chocolate-brown, joints gradually becoming shorter

but still seven to eight times their broadest diameter until penultimate joint, which is three-quarters the length of flagellar joint 1, each joint deeply incised beyond the pronounced basal swelling which bears the majority of moderately long, dark brown verticils.

In female, antennae (fig. 20, *g*) are thrice shorter than in male, being one and two-thirds to one and three-quarters the length of head and rostrum—if bent backwards, extending to end of thoracic praescutum; flagellar joint 1 elongate-cylindrical, five times as long as broad, subequal to combined scape; joints 2–4 equal, each being three-quarters of flagellar joint 1 but only three times as long as broad, the basal swelling and consequent incision feeble; joints 5–8 equal, slightly shorter and more slender than joint 4, each being four and a half times as long as broad; joints 9–11 shortening rapidly, ultimate joint subequal to penultimate. In female, ultimate joint of palpi is four times the penultimate.

Pronotum light yellow dorsally, propleura dark brown. Mesonotal praescutum dull orange-yellow with three dark stripes, the middle stripe less dark and appearing longitudinally divided by an opaque velvet-black line which is narrowed caudally and does not attain the transverse suture; a similar opaque black line surrounds each lateral stripe except for a short portion on the outside; scutal lobes whitish yellow, marked with a dark brown stripe directed outwards apically, anterior end continued along the transverse suture to above the wing root; scutellum and postnotum light yellow, the latter with a conspicuous dark brown median stripe, which is continued laterally along posterior margin of sclerite. Pleura yellow with whitish cast, having dark brown marks on lower region of mesepisternum and on mesonotum, continued along dorso-cephalic edge of mesepimeron. Legs with orange-yellow femora and dark brown tibiae and tarsi, fore coxae darkened with brown along anterior basal surface, remaining coxae yellowish. Halteres dark brown. Wings tinged light grey, veins dark yellowish brown, Sc_1 absent, Sc_2 enters Sc immediately adjacent to origin of RS , so that latter vein appears as a continuation of Sc_2 , RS short, two and a half times basal deflection of R_{4+5} , cell M_1 short-petiolate to sessile, 1st M_2 long and narrow, three to three and a half times as long as broad, point of contact between Cu_1 and M_3 beneath cell 1st M_2 as in genus *Tipula*.

Females are darker in colour; entire prothorax, whole of mesepisternum and mesosternum, practically entire mesepimeron and all the coxae coloured dark brown.

Abdomen deep orange, devoid of dark markings, ninth tergite of

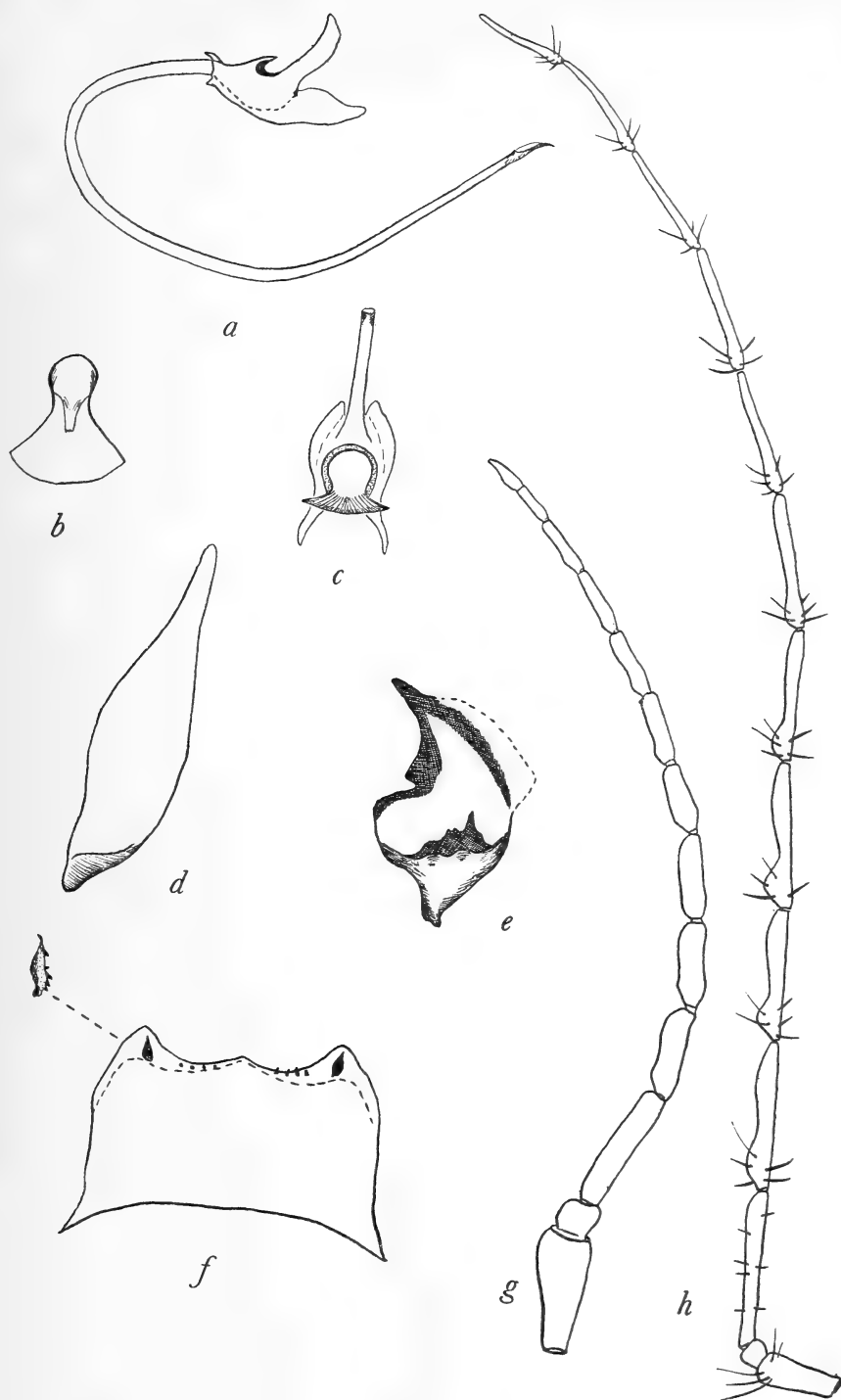


FIG. 20.—*Nephrotoma antennata* (Wiedemann). *a*, penis (lateral view); *b*, “basum” of penis (posterior view); *c*, “basum” and “latera” of penis (dorsal view); *d*, outer dististyle (male hypopygium); *e*, inner dististyle; *f*, ninth tergite (dorsal view); *g*, female antenna; *h*, male antenna.

hypopygium (fig. 20, *f*) large and broad, strongly arched from a posterior aspect, the caudal margin very broadly concave with a low, obtuse median protuberance, the lateral ends armed with a flattened heavily chitinised blade, directed ventrad, the distal margin of which is serrated by five to eight acute teeth, the mesal margin armed with eight to sixteen stout, evenly spaced spicules. Basistyles of medium size, slightly produced to truncate apices, on inner side of which articulate two dististyles; ninth sternite well chitinised, deeply incised along median line, bent inwards and bearing the aedeagal sheath. Outer dististyle (fig. 20, *d*) a fleshy, conspicuous, pubescent, flattened blade, swollen basally, then drawn out into a long, tapering, bluntly rounded tip; inner dististyle (fig. 20, *e*) a well-chitinised, slightly concave blade, apex curved dorsally to a stout, acute, chitinised hook, actual margin carinate and membranous, basal region of dististyle is produced into a low ridge, the margin of which is irregular. Aedeagal sheath short, stout, well chitinised, basal supports wide and heavily chitinised; penis slender, moderately long, curved strongly ventrad, apex narrowed and acute, basal bulbous portion lying beneath the junction of eighth and ninth segments, usually orientated through 180 degrees from the normal horizontal position, "basum" short, a wide blade, constricted basally, "latera" slender flattened blades.

In female lateral edges of abdominal segments 1-9 are often darkened to form a continuous black line, but the tergites remain devoid of markings.

Localities.—Cape Peninsula: Platteklip (K. H. B.), April 1933; Isolation Valley (K. H. B., C. W. T., H. G. W.), May 1933, April 1934; "The Round House", Camps Bay (H. G. W.), April 1934.

Cape Province: French Hoek Pass (G. A. W., H. G. W.), April 1935.

Larva.—Length 22-24 mm., diameter 3 mm. Colour light fawn, pleura and thoracic segments paler, dorsum of ultimate abdominal segment darkened with medium brown.

Form terete, moderately slender; integument thin on pleura, revealing the underlying muscles, transversely wrinkled into five raised folds on each abdominal segment.

Chaetotaxy consists of moderately long, stiff setae, jet black basally, pale yellowish brown apically. Dorsum of prothorax with six setae, a pair near each lateral margin, the outer of which is considerably longer, and two on the mesal portion, venter with transverse row of six evenly spaced setae; meso- and metathorax with one dorsal

seta situated at each postero-lateral angle, pleura with four minute setae; venter with a pair near each lateral margin. Dorsa of abdominal segments 1-7 have four setae, one at each postero-lateral angle and one on either side of median line; pleura with four setae, two anterior and two posterior, the latter setae are borne on fleshy rounded protuberances, which become increasingly prominent on segments 4-7 until on this last segment they simulate the lobes on the spiracular disc; four large evenly spaced along posterior margin and two anterior; each lateral seta borne on a small fleshy protuberance. Immediately cephalad of the gills is a ventral row of four evenly spaced setae and one pleural seta.

Spiracular disc (fig. 21, *a*) surrounded by six lobes, the four dorsal lobes elongate, wide and stout at origin, tapering to subacute membranous apices, usually strongly curved cephalad, each outer lobe somewhat longer and larger than the inner; the two ventral lobes short, triangular, inner surface marked with a transverse basal brown stripe and a small apical circular spot. Spiracles large, conspicuous, circular, separated by two-thirds the diameter of one spiracle, outer ring narrow, dark brown, inner portion large, jet black. Anal gills absent, margin of anus fleshy, dilated into six irregular folds.

Head capsule retractile, compact, massive, heavily chitinised. Basal segment of antenna (fig. 21, *f*) elongate-cylindrical, twice as long as broad, apical conical papilla reduced, sculptured basally, surrounded by four sensory pegs, three microscopic in size, the fourth and outer being three times as long. Mandible (fig. 21, *e*) heavily chitinised, produced into a subacute hooked apical tooth and a single blunt ventral cutting tooth. Hypopharynx (fig. 21, *d*) a broad flattened plate, basal lateral angles of which are produced into short chitinised arms, anterior margin with five blunt teeth, outer teeth smaller than inner, ventral surface armed with numerous stiff acute setae, dorsad of hypopharynx is attached a large rounded fleshy prementum with microscopic setae. Mentum (fig. 21, *c*) broad, anterior margin with six teeth, median tooth the longest and sharpest. Labrum and maxilla as in genus *Longurio*.

Pupa.—Length ♂ 15-18 mm., diameter 3 mm.; ♀ 19-20 mm., diameter 4 mm. Colour deep brown to dull black, usually concealed by minute grains of soil, breathing horns dark brown.

Form moderately slender, head of moderate size, cephalic crest lacking; antennal sheath (fig. 22, *c*) elongate in male, extending to end of abdominal segment 1, in female to wing axil, slender, margins especially at basal half deeply incised at each segment;



FIG. 21.—Larva of *Nephrotoma antennata* (Wiedemann). *a*, end of abdomen (posterior view) with anal gills (*a. g.*); *b*, maxilla; *c*, mentum; *d*, hypopharynx and prementum; *e*, mandible; *f*, labrum and antennae (dorsal view) with conical papilla of antenna enlarged.

labrum (fig. 22, *a*) broad, convex, apex pointed; labial lobes (fig. 22, *a*) rectangular, caudal margin constricted prior to distal angle; maxillary palpi (fig. 22, *a*) strongly recurved for two-thirds their length, tapering to acute points.

Pronotal breathing horns (fig. 22, *b*) moderately long, divergent, equal in length, cylindrical, margins strongly crenulate, tips much dilated (lateral aspect), broadly rounded. Mesonotum convex, transversely wrinkled, armed with a large conical protuberance midway between origin of each breathing horn and insertion of wing pad, caudad occurs an additional yet smaller protuberance on either side of median line, bearing two short stiff setae. Wing pads extend to end of abdominal segment 2, leg sheaths in male almost to end of abdominal segment 4, in female to end of segment 3, tips of tarsi forming a shallow V.

Abdominal segments 2-7 subdivided into two annuli of equal length, each anterior annulus devoid of spines except in pleural region where a single slender acute spine occurs on the carinate margin; posterior annuli armed as follows: dorsa of segments 2-7 with 6, 10, 10, 11, 10, 6-8 spines in a transverse subterminal row; pleura of segments 3-7 with a slender hooked spine on carinate margin, the last two segments having an additional small spine ventrad and slightly cephalad; venter of segment 3 with a pair of spines on either side of leg sheaths, the inner large, twice the outer which bears two short apical setae, of segments 4-7 with a transverse row of five spines, the inner three very large, stout, tapering to acute chitinated apices, each outer spine small, conical, bearing two apical setae. Spiracles difficult to detect.

♂ cauda (fig. 22, *e, f*): At base, on segment eight, occur eight powerful lobes tapering to spinous chitinated apices, four dorsal, of which the dorso-median are small and slender, two ventral and one on each pleural region; tergal sheaths wide and stout at origin, bent at mid-length, tapering to acute apices; sternal sheaths lacking, at most mere indications exist in the form of two microscopic rounded lobes ventrad of tergal sheaths, which are armed with a ventral basal lobelike spine.

♀ cauda (fig. 22, *d*): Similar in armature to male, tergal sheaths elongate, tapering, apices slightly divergent; sternal sheaths thicker, shorter, contiguous, apices truncate.

Remarks.—The conspicuously coloured adults of this widespread species occur in vast numbers during the autumn months and are frequently mistaken by the layman for “giant mosquitoes.”

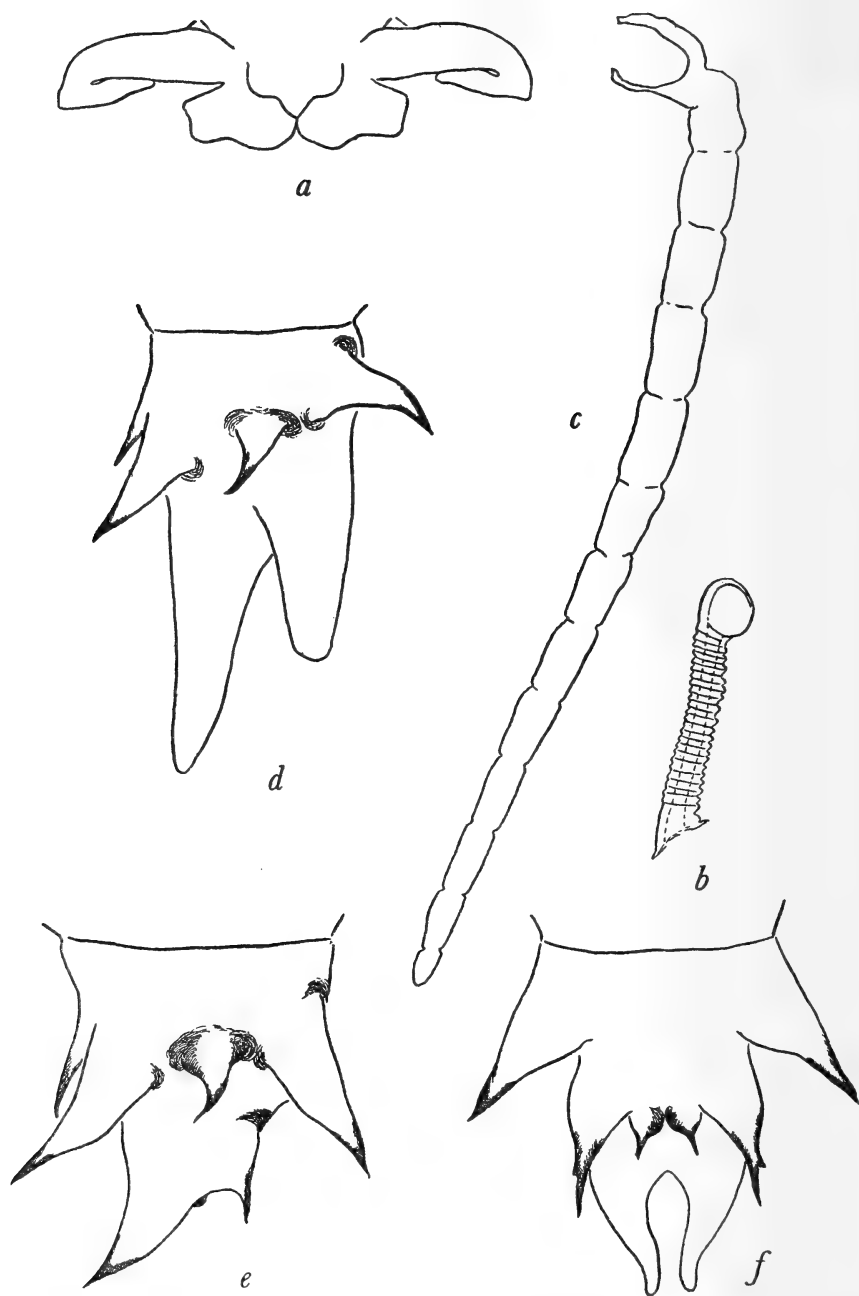


FIG. 22.—Pupa of *Nephrotoma antennata* (Wiedemann). *a*, mouth parts; *b*, pronotal breathing horn; *c*, antennal sheath; *d*, female cauda (lateral view); *e*, male cauda (lateral view); *f*, male cauda (dorsal view).

Empty pupal cases of this species were found in great numbers by Dr. Barnard, Mr. Thorne and the author while they were engaged in the search for the immatures of *Tipula coronata* (Table Mountain, May 1933). In April 1934, at the same locality, over thirty fully grown larvae were discovered dead on the surface of the soil amid the *Restio* clumps. These apparently had been drowned by the heavy and continuous rainfall which had fallen two days previously, when the larvae were resting just beneath the soil prior to pupation.

The credit of the indubitable correlation of immatures to imagos of this species must be given to Dr. Barnard, who bred the flies from larvae collected in the rich soil along the margin of a forest stream (Platteklip, April 1933).

Nephrotoma petiolata (Macquart)

Fig. 23.

1838. p. 49 (*Pachyrhina*).

1888. Bergroth, p. 140 (*Pachyrrhina*).

1917. Alexander, pp. 179-180, pl. xii, fig. 41 (wing) (*Nephrotoma*).

The following notes will supplement the scanty description of Macquart and the brief observations given by Bergroth. Alexander gave four lines on head and ninth tergite, but figured the wing.

♂: Length 13-14 mm., wing 13-13.4 mm. Head orange-yellow; eyes jet black; nasus prominent, not bifid, clothed with coarse black hairs, the dark colour continued caudad as a median stripe to origin of rostrum; dark brown occipital mark continued as slender stripe on to high frontal tubercle; palpi dark brown; ultimate joint whip-like; antennae (fig. 23, *c*) 13-jointed, moderately elongate, three and a half times the length of combined head and rostrum—if bent backwards, extending almost to base of abdomen; scape orange-yellow; entire flagellum dark blackish brown; flagellar joint 1 elongate-cylindrical, six and a half times as long as broad, one and a third times the combined scape; remaining joints deeply incised beyond pronounced basal swelling, joints 2-6 each being four-fifths of flagellar joint 1 but are relatively thicker, being only four times as long as broadest diameter; joints 7-10 gradually becoming shorter; ultimate joint one-quarter of the penultimate.

In female, antennae (fig. 23, *d*) are one and a half to one and two-thirds the length of head and rostrum, extending to end of

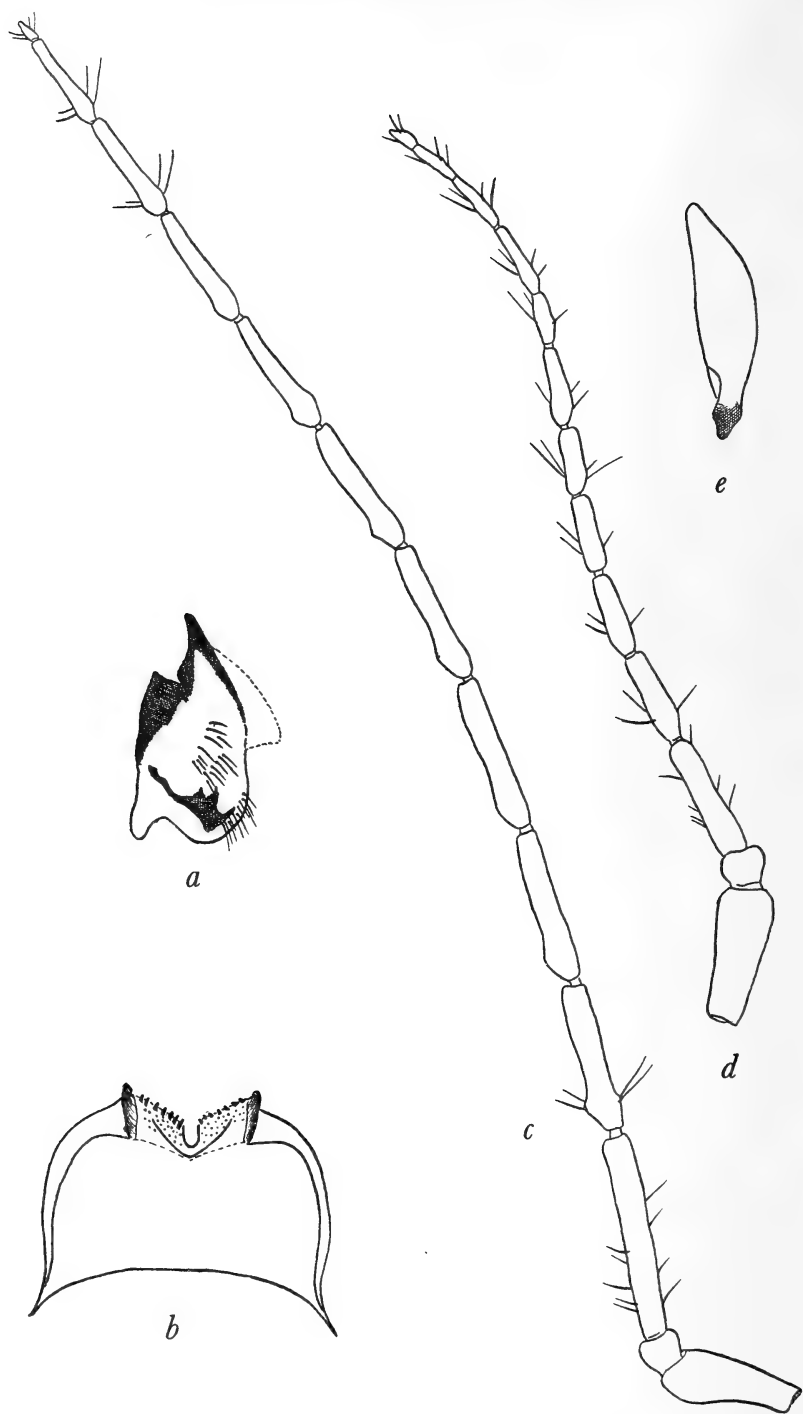


FIG. 23.—*Nephrotoma petiolata* (Macquart). *a*, inner dististyle (male hypopygium); *b*, ninth tergite (ventral view); *c*, male antenna; *d*, female antenna; *e*, outer dististyle (male hypopygium).

mesonotal praescutum, thus the antennae are one-half those of the male; flagellar joint 1 three-quarters of combined scape, four times as long as broad; remaining joints as in male; ultimate joint one-half the penultimate.

Pronotum light yellow dorsally, propleura dark brown; this coloration continued on to the dorso-cephalic surface of fore coxae. Distribution of stripes on mesonotal praescutum, scutal lobes and scutellum as in *antennata*, but these stripes are entirely jet black, postnotum light yellow, usually entirely unmarked. Frequently some males and females have a feeble indication of a thin median stripe. Pleura orange-yellow with whitish cast. Legs orange-yellow, becoming dark brown on tibiae and tarsi. Halteres dusky brown. Wings tinged with pale brown, veins yellowish brown, Sc_1 absent, Sc_2 enters Sc adjacent to origin of RS ; RS short, one and three-quarters basal deflection of R_{4+5} ; cell M_1 usually sessile, 1st M_2 two and a half to two and two-third times as long as broad, insertion of Cu_1 varies, before origin of M_3 by a distance subequal to basal deflection of R_{4+5} to immediately adjacent to origin of M_3 .

Abdomen orange-yellow, frequently unmarked in some males, in other males and most females there occur black diamond-shaped marks of tergites 2-6; the thin double stripe along the edge of pleurites is continued on to tergites and sternites of segments six and seven across the posterior margin, entire eighth sternite dark blackish brown. Ninth tergite (fig. 23, *b*) large and broad, caudal margin concave, armed with fourteen black spicules and a conspicuous median rounded incision, along each side of which occur six spicules; each lateral end of tergite prolonged into a chitinated ventral ridge bearing ten spicules; fine setae are scattered on ventral surface between the incision and lateral ridges. Outer dististyle (fig. 23, *e*) a fleshy lobe, narrowed basally, slightly dilated mesally, then rapidly tapering to rounded apex; inner dististyle (fig. 23, *a*) as in *antennata*.

Localities.—Cape Peninsula: Newlands (H. G. W.), December 1939, September 1944.

Cape Province: Oudebosch (C. W. T., H. G. W.), September 1933, January 1934; du Toits Kloof (G. A. W., C. W. T., H. G. W.), April 1934; Cold Bokkeveld (Versfeld), October 1934; Schoemans Poort (H. G. W.), January 1938; Tradouw Pass (G. A. W., H. G. W.), January 1938; Skurfteberg (K. H. B., C. W. T.), October 1937.

Transvaal and Rhodesia (Alexander).

Larva.—Length 22–24 mm., diameter 3–3·2 mm. Similar in structure, head capsule and spiracular disc to *antennata*. Chaetotaxy as in *antennata*, but the pleural protuberances on segments 4–7, which are so prominent in *antennata*, are absent.

Antenna elongated, four to four and a half times as long as broad, cylindrical, slightly curved at mid-length, apical papilla much reduced, a narrow ring surrounded by three to four microscopic sensory pegs.

Pupa.—Length 17–17·5 mm., diameter 2·8–3 mm. As in *antennata*; antennal sheath of male ending opposite junction of thorax and abdomen.

Remarks.—The larvae of this species were found in a forest-clearing at Oudebosch (January 1934) and were closely associated with the immatures of *Longurio capicola*. Both forms occupied adjacent patches of ground but did not intermingle, although they exist on a similar diet (see life-history *L. capicola*).

During egg-laying the female flutters over the surface of the soil in clumsy fashion with the abdomen directed sharply downwards. When a suitable spot is reached, she bobs up and down on her middle and hind legs, stabbing the ground rapidly with the ovipositor. The wings are kept widespread to maintain the balance. An egg is usually deposited after every four to six stabs. The entire procedure may occupy several hours during which time about two hundred and thirty eggs are deposited.

Nephrotoma umbripennis Alex.

Fig. 24.

1917. pp. 172–173, pl. xii, fig. 34 (wing); pl. xiv, fig. 62 (9th tergite).

♂: Length 14–15 mm., wing 15–15·6 mm. Head orange; antennae (fig. 24, *a*) 13-jointed, very elongate, eight times as long as head and rostrum—if bent backwards, extending to end of abdominal segment 3; scape yellow; joint 1 clavate; joint 2 subglobular, small; flagellar joint 1 yellow basally, becoming dark brown apically, elongate-cylindrical, seven and a half to eight times as long as broad, practically twice as long as combined scape; remaining joints dark chocolate brown, incised beyond basal swelling; joints 2–5 equal in length but broader than flagellar joint 1, being only five to six times as long as broadest diameter; joints 6–10 gradually becoming shorter

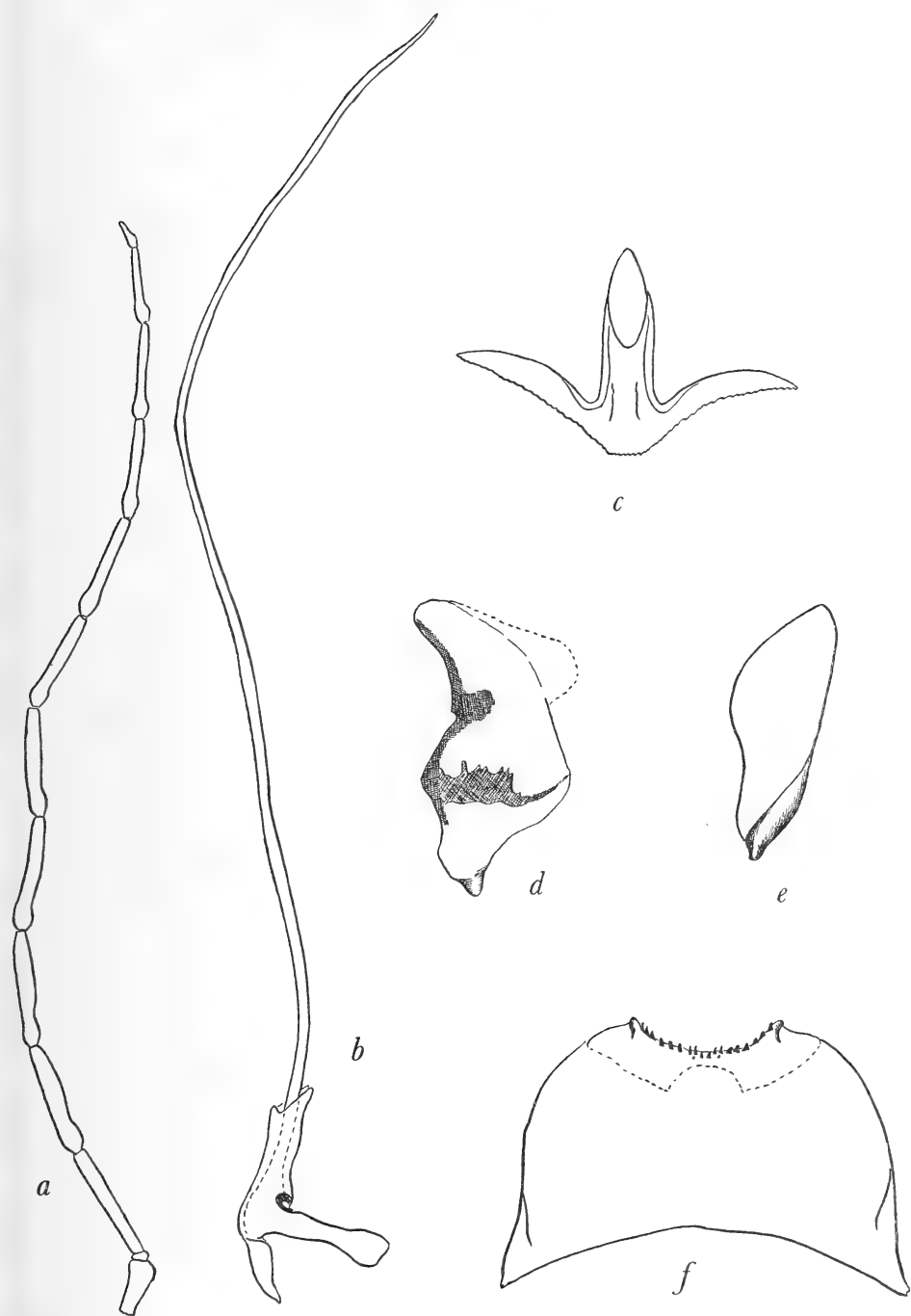


FIG. 24.—*Nephrotoma umbripennis* Alex. *a*, male antenna; *b*, penis (lateral view); *c*, aedeagal sheath (dorsal view); *d*, inner dististyle; *e*, outer dististyle; *f*, ninth tergite.

but much thinner, being eight to nine times as long as broad; ultimate joint tapering, one-half the penultimate.

Thoracic and abdominal coloration and venation of wing well described and figured by Alexander.

Caudal margin of ninth tergite (fig. 24, f) chitinised, slightly concave, armed with twenty small stout spines, produced at each lateral angle into a subacute chitinised apex, directed ventrad. Outer dististyle (fig. 24, e) a fleshy lobe, narrow basally, much dilated mesally, then tapering to bluntly rounded apex; inner dististyle as in *antennata*, but apical hook is wide and bluntly rounded. Aedeagal sheath (fig. 24, c) moderately long, stout; apex acute. Penis (fig. 24, b) elongate, slender, six times as long as the length of basal portion.

Remarks.—The male hypopygium of this species is similar in general appearance to that of *N. antennata* and of *N. petiolata*, being therefore typical of the genus *Nephrotoma*. Alexander's statement (1917, p. 173) that in "the male hypopygium this form closely approaches *Tipula*" is misleading. In the genus *Tipula* (see pages 25–26 in this paper) the inner dististyle is a complex structure armed with various processes and protuberances; the median margin of the ninth tergite is usually produced into a lobe of specific shape and size.

Localities.—Cape Peninsula: nil.

Cape Province: Kaaimans Gat (G. A. W., H. G. W.),
April 1933.

South Africa, without exact locality (Alexander).

Genus DOLICHOPEZA Curtis

1825. No. 62.

1925a. Alexander, pp. 41 *seq.*

Imago.—Males and females normally winged; body coloration usually obscure yellow and dark brown; nasus inconspicuous, not bifid; terminal joint of maxillary palpi elongate, whiplike, approximately four times the length of penultimate joint; legs usually long and filiform; antennae 13-jointed, but ultimate joint in males usually less than half the penultimate; female antennae sometimes much shorter than in male, in which case the ultimate joint equals the penultimate in length; wings with vein R_{1+2} usually atrophied, sometimes present, Sc usually short, Sc_1 atrophied, Sc_2 enters Sc very close to origin of RS ; cell M_1 petiolate, never sessile; 1st M_2 open by atrophy of basal section of M_3 , the outer medial field thus appearing

pectinately branched; ninth tergite of male hypopygium of varying specific shape; two dististyles articulate with each basistyle; outer dististyle fleshy, cylindrical (except *fluminis*); inner dististyle revealing specific variations; female ovipositor moderately elongated, valves acicular, never reduced or fleshy.

Larva.—Form plump, terete; coloration vivid green; chaetotaxy inconspicuous, reduced. Spiracular disc surrounded by six distinct lobes; on each side of penultimate segment occurs a stout tubercle which simulates the dorsal lobes of disc. Head capsule retractile, compact, massive; basal segment of antenna elongate-cylindrical, twice as long as broad; apical papilla microscopic. Hypopharynx three-toothed; mentum seven-toothed. Labrum, mandible and maxilla as in genus *Longurio*. Anal gills four, short, stout, protuberant.

Pupa.—Cephalic crest absent. Sheaths of maxillary palpi strongly recurved. Pronotal breathing horns elongate, conspicuous, wide at base, tapering, apices dilated (lateral aspect); abdominal segments with subterminal row of spines on sternites 7–9 only; lateral margins of tergites and sternites mottled with irregular brown spots and blotches consisting of closely placed striae of chitin. Cauda armed with four dorsal, four ventral and two lateral lobelike spines on anterior portion; at origin of tergal sheaths an additional spine; in male, tergal sheaths are fingerlike, curved dorsad and inwards, sternal sheaths smaller, blunt; in female, tergal sheaths elongate, contiguous medially, longer than the small sternal sheaths; outer basal surface of each sternal sheath is produced into a powerful and conspicuous lobelike spine, which is larger in female cauda.

Seven species of *Dolichopeza* inhabit the S.W. Cape district; the life-histories of two of them are herein described. The adults are to be found in moist shady places, *e.g.* around the buttresses of forest trees, beneath culverts, in caves and clefts along the banks of streams and on shrubs and grasses of waterfalls. The immature stages, however, are most conservative in their choice of habitat and occur in or beneath wet to saturated mats or cushions of moss and liverwort on the sides of waterfalls, or on roots in the flowing rill and streams. The larvae of the genus are the only members of the family Tipulidae in the S.W. Cape that may be found in sphagnum moss. An examination of the alimentary contents reveals that they are vegetarians, feeding on the leaves of moss and liverwort, the chlorophyll of which colours the body a dark vivid green. During torrential rains the larvae are to be found in the scanty soil below the moss cushions,

where they rest head upstream with the spiracular disc closed but with the anal gills distended. In normal conditions the larvae are to be found just beneath the surface of the moss. The pupae occur in the drier regions of the moss, usually six to twelve inches away from the edge of the flow of water, resting head upwards, this position being maintained by the solidity of the drying moss. The pupal stadium occupies twelve to sixteen days, the "shucks" after the emergence of the imago protrude from the moss and indicate to the collector the possible *locale* of additional larvae and pupae. The teneral adults are paler in colour with the abdomen a vivid green—a colour which disappears after three to six hours as the body coloration becomes apparent. Copulation takes place usually in some shady retreat and is of an average duration of three to four minutes. During copula the female rests against a suitable support by means of two or four legs with the wings folded lengthwise over the abdomen and bears the entire weight of the male. The male is thus suspended head downwards from the end of the abdomen by the hypopygium only. His legs are widespread and the wings are set at right angles to the body. If disturbed while in copula, the female frequently flies away with the male attached to another neighbouring retreat. In the normal resting position of the male (*i.e.* when not in copula) the wings are folded lengthwise over the abdomen.

Although the species reveal slight differences in wing venation and in the shape and length of the antennae, the male hypopygium is the only satisfactory structure for the exact determination of the species. In this hypopygium the ninth tergite is reduced in size, the caudal margin being variously produced and denticulate according to species. This tergite is fused laterally with the enlarged basistyles, the ninth sternite being fleshy and inconspicuous, serving merely to join the ventral portions of the basistyles together and to support the aedeagal sheath. Ventrad of each end of this ninth tergite occurs a conspicuous flattened lobe of specific shape, covered with a varying number of black spicules. The basistyle is large and is covered with a fine pubescence, in addition to which often occur numerous scattered elongate setae. On the dorso-caudal margin of each basistyle articulate two dististyles: the outer uniform in shape throughout the genus, being elongate-cylindrical, although its length varies; inner dististyle a simplified appendage, the shape of which varies considerably and is especially useful for specific determination. Aedeagal sheath short, dilated apically; penis slender, moderately long; bulbous basal portion of penis lying beneath the seventh and

eighth segments, usually turned away from the normal horizontal position, the basal plate of specific shape and size, the two dorsal and two ventral plates uniform throughout the genus, these five plates being processes for the attachment of muscles.

Key to Species of Dolichopeza.

1. Coloration light orange-yellow, including head; thoracic stripes scarcely indicated; wings tinged with yellow, R_{1+2} entirely preserved; ventral plates on either side of ninth tergite large, oval *aurantiaca*.
 Coloration darker; mesonotal praescutum usually dark brown or yellow with dark brown stripes; head usually marked with brown; wings tinged with brown; R_{1+2} usually more or less atrophied; ventral plates of ninth tergite small, usually square (absent in *barnardi*) 2.
2. Mesonotal praescutum uniformly dark brown; petiole of cell M_1 short (fig. 32, c), merely one-third to two-thirds the petiole of cell M_2 ; cell M_1 consequently elongate, five to ten times its own petiole *flavifrons*.
 Mesonotal praescutum yellow with three to four brown stripes; petiole of cell M_1 longer (fig. 30, b), equal to or longer than petiole of cell M_2 ; cell M_1 shorter, usually one and two-thirds to three times its own petiole 3.
3. Ninth tergite highly arched (fig. 25, c), the margin smooth medially; ventral plates at each end produced mesad as a narrow strip, which bears blackened spicules; inner dististyles (fig. 25, a) heavily chitinated, longitudinally grooved and ridged *thoracica*.
 Ninth tergite not arched; ventral plates not produced mesad; inner dististyle not longitudinally grooved or ridged 4.
4. Ventral plates absent; inner dististyle (fig. 29, e) narrow at base, then dilated to form a shallow Y, the arms of which are slightly produced; tip of outer dististyle having numerous acute spines *barnardi*.
 Ventral plates at each end of ninth tergite present (fig. 25, d); inner dististyle not Y-shaped; tip of outer dististyle unarmed 5.
5. Outer dististyle (fig. 25, g) elongate-cylindrical; petiole of cell M_1 equal to or one and a quarter times the petiole for cell M_2 ; cell M_1 equal to or three times its own petiole 6.
 Outer dististyle (fig. 30, d) not elongate-cylindrical but a flattened blade, narrow basally, then dilated to wide apex . . . *fluminis*.
6. Inner dististyle (fig. 25, f) a large flattened blade, moderately chitinated, becoming narrowed after the dilated base and curved strongly dorsad, apex bluntly rounded, inner surface prior to apex with a small blunt spine; cell M_1 three times its own petiole, thus cell M_1 deep and narrow; basal portion

of penis horizontal (fig. 25, *i*), median ventral keel of basal plate deep and rounded, basal plate moderately concave; first flagellar joint moderately elongate-cylindrical, five to six times its diameter, one and two-thirds the length of the second joint; joints 3-9 three times their diameter in length *hirtipennis*.
 Inner dististyle (fig. 28, *f*) comparatively short and stout; cell M_1 equal in length to its petiole, thus cell M_1 wide and shallow; basal portion of penis twisted through 110 degrees (fig. 28, *g*), basal plate very wide and very shallow, keel restricted to an inconspicuous basal strip (fig. 28, *g*, *e*); first flagellar joint elongate-cylindrical, six to seven times its diameter, scarcely longer than the second joint; joints 3-10 five times their diameter in length *peringueyi*.

Larvae.

Four dorsal lobes equal in size, short, bluntly rounded, their margins densely fringed with black hairs *hirtipennis*.
 Four dorsal lobes unequal, the median lobes short, conical, the lateral lobes elongate, tapering to slender apices, all lobes glabrous *flavifrons*.

Pupae.

The pupae of *D. hirtipennis* are indistinguishable from those of *D. flavifrons*.

Dolichocheza hirtipennis Alex.

Figs. 25, *d-i*; 26, *a-g*; 27.

1917. pp. 157-158, pl. xi, fig. 21 (wing) (Non *hirtipennis* Alex., 1921, p. 211. = *picticeps* Alex., 1925a).

♂: Length 9.5-10 mm., wing 12-13 mm. Holotype male well described by Alexander, but the details of the hypopygium were not given. In 1921 (p. 212), while describing *Dolichocheza aurantiaca*, Alexander gave a short comparative reference to the hypopygium of *hirtipennis*, stating that on the ninth tergite "the band is irregularly and finely denticulate or roughened"; it was not stated, however, whether this character was taken from the Cape type specimens described in 1917, or from the Natal specimens assigned in 1918 to *hirtipennis*, which were later (1925) redescribed as *picticeps*.

Ventrad of each end of ninth platelike tergite (fig. 25, *d*) is a short, square, heavily chitinised, flattened lobe bearing twenty to twenty-four small stout black spicules over the entire dorsal surface. Outer dististyle (fig. 25, *f*) fleshy, cylindrical, clothed with a fine pubescence,

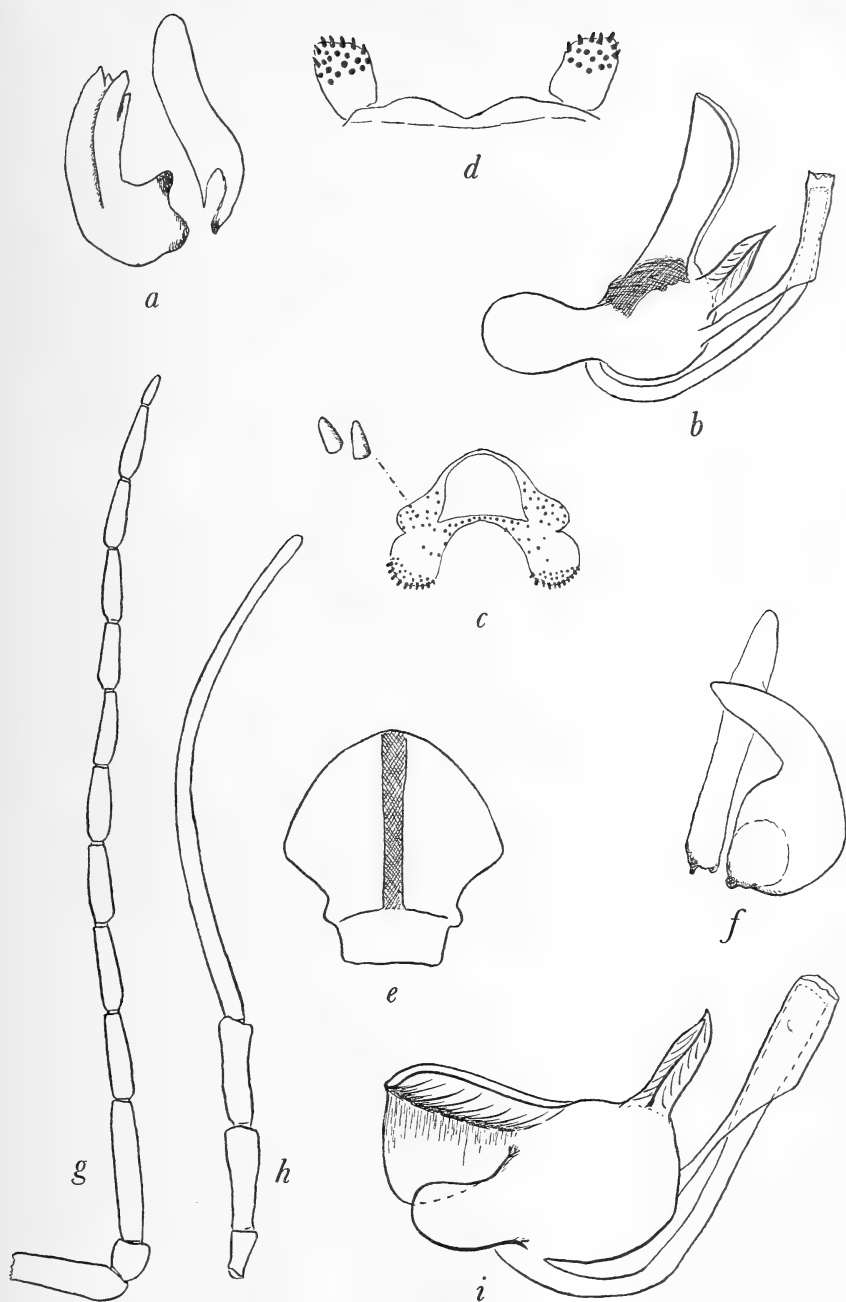


FIG. 25.—*Dolichochepeza thoracica* Alex. *a*, outer and inner dististyles (male hypopygium); *b*, penis and aedeagal sheath (lateral view); *c*, ninth tergite (posterior view). *Dolichochepeza hirtipennis* Alex. *d*, plates at end of ninth tergite (dorsal view); *e*, "basum" of penis; *f*, outer and inner dististyles (male hypopygium); *g*, antenna; *h*, maxillary palpus; *i*, penis and aedeagal sheath (lateral view).

in which are scattered elongate outspreading setae; inner dististyle (fig. 25, *f*) a large flattened blade, moderately chitinated, becoming narrowed after the dilated base and curved strongly dorsad, this hooked region being more heavily chitinated, apex bluntly rounded, inner surface prior to apex produced into a small blunt spine. Aedeagal sheath short, stout, dilated apically, through which usually projects the slender elongate penis (fig. 25, *i*) which curves strongly ventrad and which arises from the cephalic region of the large dilated base. This basal portion of the penis usually lies within the seventh and eighth abdominal segments and has experienced no orientation from the normal horizontal position. The basal plate (fig. 25, *e*) is wide, moderately long and moderately concave, being constricted basally; the median keel (fig. 25, *i*) is deep and rounded; the two ventral plates are wide and flat, with rounded margins, the dorsal plates are slender and taper to acute apices.

Antennae (fig. 25, *g*) 13-jointed, rather short, only one and two-thirds the entire length of head and rostrum, clothed with a fine pubescence and a few sub-basal verticils; scape light yellow, first joint slightly darker yellow, flagellum dark brown, pale apically; flagellar joint 1 elongate-cylindrical, five to six times as long as diameter, one and two-thirds the length of the second joint which consequently appears abruptly shorter; joints 3-9 gradually becoming slightly shorter, elongate-cylindrical, approximately three times their diameter in length, anterior regions tending to dilate somewhat; penultimate joint slightly longer than previous joint, narrowed apically; ultimate joint short, less than one-half the penultimate, rounded apically. Palpi (fig. 25, *h*) equal in length to antennae, first three joints light brown, ultimate joint whitish, whiplike, twice as long as first three joints combined.

Wings (figured by Alexander, 1917) with vein R_{1+2} atrophied; petiole of cell M_2 equal to petiole of cell M_1 , which is three times the length of either petiole.

Localities.—Cape Peninsula: Echo Valley (K. H. B., H. G. W.), March 1932; Lekkerwater (G. A. W., H. G. W.), March 1933; Kirstenbosch (H. G. W.), November 1932.

Cape Province: Landdrost (K. H. B.), 1919; (K. H. B., C. W. T., H. G. W.), January 1933; Sneeuwgat (K. H. B., C. W. T., H. G. W.), November 1933; du Toits Kloof (G. A. W., C. W. T., H. G. W.), April 1934.

Larva.—Length 17–20 mm., diameter 3–3.5 mm. Colour a dark vivid green due to the presence of chlorophyll in fresh specimens, the colour rapidly disappearing in alcohol; preserved specimens dark brown, ventral surface paler brown; integument covered with microscopic velvet pubescence.

Form terete, plump, the greatest diameter about the fourth abdominal segment; segments are much wrinkled dorsally, the opaque integument revealing minute transverse ridges.

Chaetotaxy reduced to a row of four short setae along posterior margin of abdominal segments; inconspicuous against the dark body colour. On each side of the penultimate segment occurs a stout, blunt, conical tubercle which simulates the dorso-lateral lobes of the spiracular disc; this disc (fig. 26, *f*) being moderate in size, white and conspicuous against the dark body colour, surrounded by six short, fleshy, blunt lobes, four along the dorsal margin of disc and two ventral lobes, all six lobes being fringed with dark brown curved hairs, the four dorsal lobes equal in size, bluntly rounded apically; inner margins of dorsal lobes marked by a dark brown crescent, dilated dorsally; dorso-lateral lobes marked on the mesal region by small brown semicircle; ventral lobes the longest, stout at base, inner face a black triangular mark; spiracles oval, obliquely placed, separated by one and a half times the diameter of one spiracle, outer ring dark brown, inner portion black; ventrad of each spiracle an elliptical light brown mark. Anal gills four, cream, massive, blunt, conspicuously protuberant, equal in size.

Head capsule retractile, compact, massive, heavily chitinised, the prefrontal sclerite large and conspicuous. Basal segment of antenna (fig. 26, *e*) elongate-cylindrical, twice as long as broad, the solitary conical apical papilla much reduced, membranous, microscopic, about three times the length of each sensory peg which surrounds it. Mandible chitinised, small for the size of the head capsule, produced into a blunt apical tooth and a single rounded ventral cutting tooth; occasionally there exists an indication of a small dorsal tooth. Hypopharynx (fig. 26, *a*) a broad flattened plate, basal lateral angles of which are produced into chitinised arms, anterior margin with three broad, blunt teeth, dorsal surface with stiff acute setae; ventrad of hypopharynx and attached to it basally is the large rounded fleshy prementum with microscopic scurfiness (fig. 26, *a*). Mentum (fig. 26, *d*) broad, anteriorly with seven blunt teeth, median tooth the largest. Labrum and maxilla as in genus *Longurio*.

Pupa.—Length 12 mm., diameter 2.3–2.5 mm. Coloration in field

a dark vivid green; preserved specimens light yellowish brown; breathing horns and cauda chitinised; pleural regions and wing pads

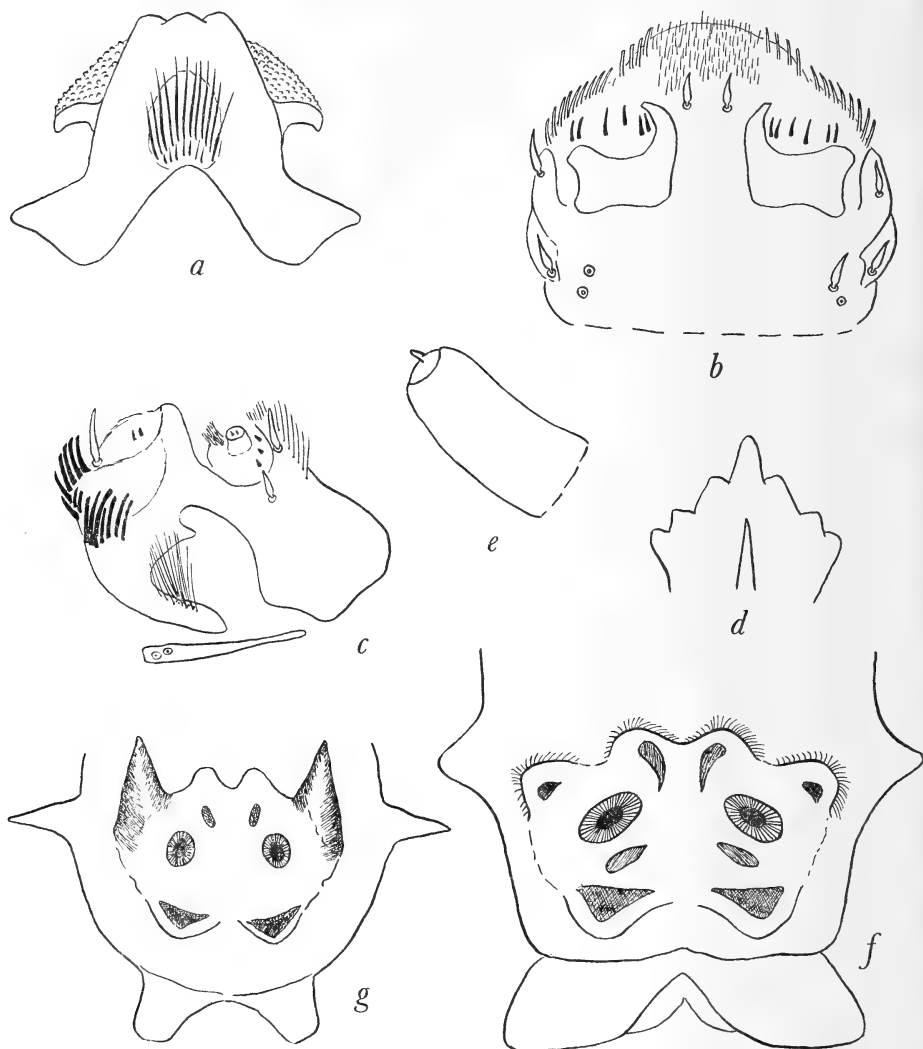


FIG. 26.—Larva of *Dolichozepea hirtipennis* Alex. a, hypopharynx and prementum; b, labrum (dorsal view); c, maxilla; d, mentum; e, antenna; f, spiracular disc. *Dolichozepea flavifrons* Alex. g, spiracular disc.

light yellowish brown; lateral margins of tergites and sternites with dark brown spots and blotches, which on closer examination prove to be closely placed striae of chitin.

Form moderately slender; head of moderate size; cephalic crest absent, at most represented by a small conical tubercle on inner side of antennal sheath, which is slender, elongate, extending to opposite end of mesonotum; labrum (fig. 27, *b*) broad, produced to subacute apex; labial lobes truncate along margin; maxillary palpi stout basally, strongly recurved to blunt apices.

Pronotal breathing horns (fig. 27, *a, b, c*) directed slightly outwards and dorsad, equal in length, elongate and conspicuous, slightly dilated basally, tapering, apices swollen and rounded (lateral aspect). Mesonotum high, convex, transversely wrinkled, median line slightly carinate; metanotum with six minute striated punctures arranged in form of a horseshoe, laterad of each middle puncture a single setiferous puncture; first abdominal segment with a transverse row of eight striated punctures. Wing pads extend to end of abdominal segment 2 and leg sheaths almost to end of segment 4, tips of tarsi level.

Abdominal segments 2-7 subdivided into two equal annuli, devoid of spines or setae, except sternites 7-9, which are armed with a subterminal transverse row of minute acute spines, their number being nine, fourteen, twelve; the dorsa of abdominal segments 2-7 are further marked with two striated punctures on the anterior edge of the segment.

♂ cauda (fig. 20, *d, e*): Tergal sheaths fingerlike, curved dorsad and inwards, longer than the sternal sheaths which are blunt and wide; the outer basal surface of each sternal sheath is armed with a prominent slender tapering spine directed slightly laterad and ventrad; at origin of tergal sheath occurs a stout spine which is usually strongly bifid, each bifurcation being well chitinised; anterior portion of cauda armed with four dorsal, four ventral and two lateral lobelike tapering spines, the last being the largest and most prominent; frequently some of the lobes tend to become slightly bifid at their apices.

♀ cauda (fig. 27, *f, g*): Lobelike spines on anterior portion of eighth segment arranged as in male; tergal sheaths elongate, tapering to rounded apices, considerably longer than the sternal sheaths which are stout and wide at base, tapering to acute apices, outer basal margin of each latter sheath produced directly laterad into a conspicuous and powerful spine, stout at base, tapering to acute apex; spine at origin of tergal sheath as in male.

Remarks.—Adults were first bred from larvae collected at Landdrost by Dr. Barnard, Mr. Thorne and the author in January 1933. Beling (1886, pp. 189-191) described the larva of *Dolichopeza albipes* as having only five lobes surrounding the spiracular disc—the median

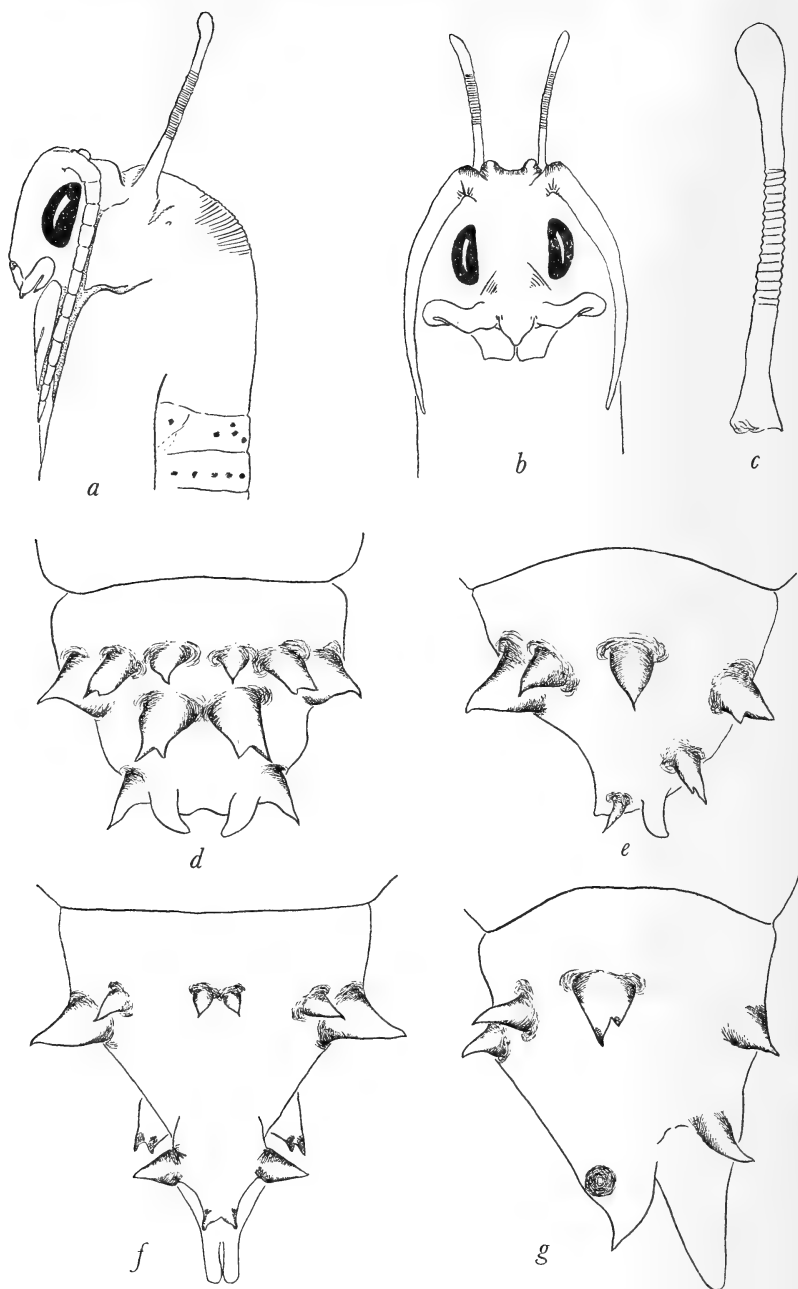


FIG. 27.—Pupa of *Dolichopeza hirtipennis* Alex. *a*, head and thorax (lateral view); *b*, head (ventral view); *c*, pronotal breathing horn; *d*, male cauda (dorsal view); *e*, male cauda (lateral view); *f*, female cauda (dorsal view); *g*, female cauda (lateral view).

lobe of the three dorsal lobes was formed by the apparent fusion of two lobes. This condition is most unusual for a Tipuline larva. Since that date no additional life-history of *Dolichocheza* has been recorded or described. The larvae of the two S.W. Cape species described herein are therefore particularly interesting in that six distinct and separate lobes surround the spiracular disc; this feature being in keeping with the other closely allied genera comprising the subfamily Tipulinae. The immatures of the S.W. Cape species closely resemble those of the American *Oropeza obscura* described and figured by Alexander (1920a, pp. 982-984) and which now constitutes the subgenus *Oropeza* of the genus *Dolichocheza*. Unfortunately, Beling did not describe or figure the head capsule of his larva. The author ventures to suggest that the number of lobes surrounding the spiracular disc in Beling's larva of *Dolichocheza albipes* was due to some abnormality or mutation and that it was not typical of the genus *Dolichocheza* (sens. str.).

Dolichocheza peringueyi Alex.

Fig. 28.

1925a. pp. 46-47.

♂: Length 7 mm., wing 8.2 mm. Holotype male well described but not figured by Alexander, the hypopygium having "ninth tergite flattened, feebly arched, consisting of a small plate, the caudal margin smooth, with a broad and shallow U-shaped notch; ventrad of the lateral ends of this tergal plate a short, chitinised lobe bearing comparatively few" (fifteen to nineteen) "small black spicules that are broadly interrupted on the median area.

"Outer dististyle unusually long and conspicuous, cylindrical, with outspreading setae; inner dististyle comparatively short and stout, chitinised, the apex subtruncate and bearing two small teeth" (see fig. 28, f).

Aedeagal sheath as in *hirtipennis*; slender penis arises from the cephalic region of the bulbous base; basal portions have undergone a torsion of 110 degrees, the ventral plates being directed cephalad, the basal plate directed dorsad and the dorsal plates curving dorso-caudally; the basal plate (fig. 28, e) is short, very wide and very shallow, margins chitinised, median keel restricted to an inconspicuous strip.

Antennae (fig. 28, a) 13-jointed, elongate, three and a half to three

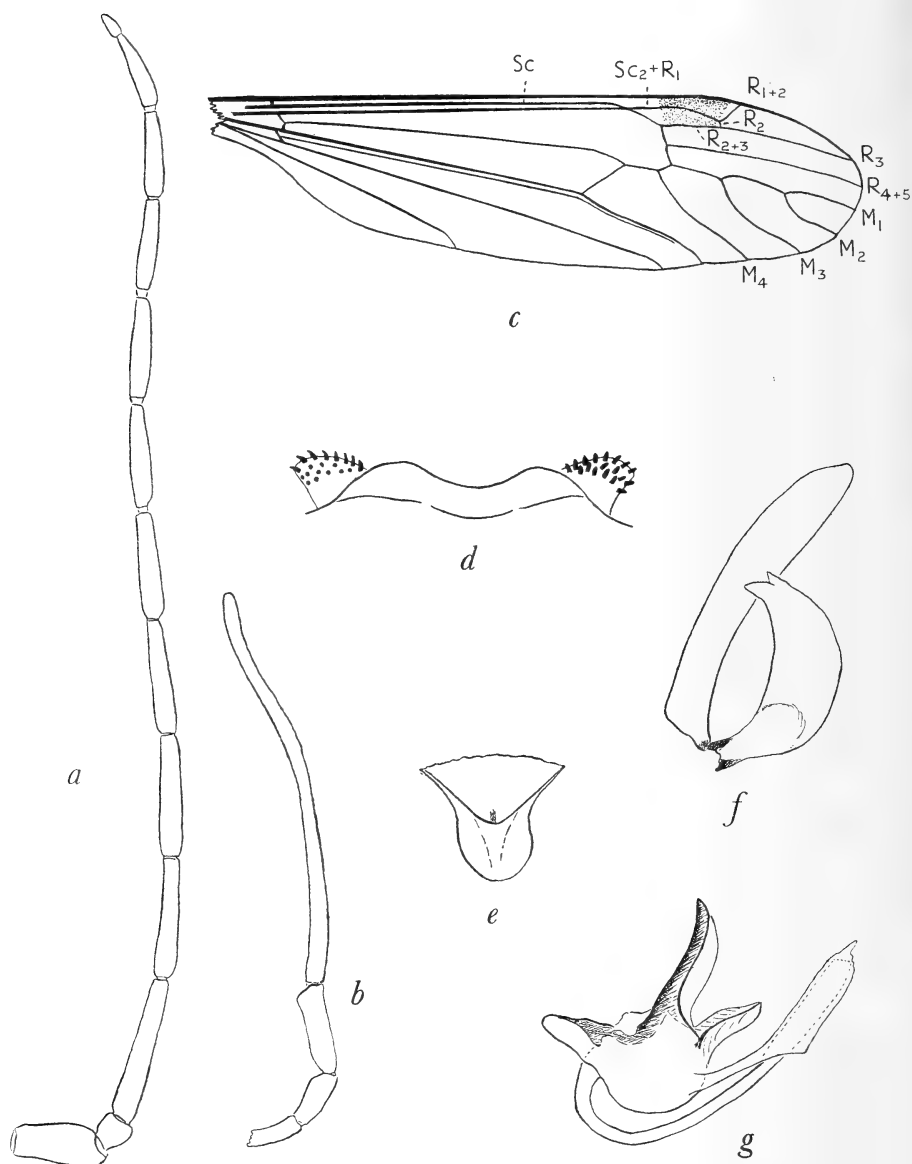


FIG. 28.—*Dolichozepe peringueyi* Alex. a, antenna; b, maxillary palpus; c, wing; d, caudal margin of ninth tergite (dorsal view) with ventral plates; e, "basum" (dorsal view); f, outer and inner dististyles (male hypopygium); g, penis and aedeagal sheath (lateral view).

and three-quarters the length of entire head; scape yellow; flagellum dark brown; flagellar joint 1 elongate-cylindrical, six to seven times its diameter; joint 2 slightly shorter, the difference scarcely noticeable; joints 3-10 gradually becoming shorter, elongate-cylindrical, length about five times their diameter; ultimate joint one-third the penultimate, rounded apically; palpi (fig. 28, *b*) with the ultimate joint twice joints 1-3, whiplike.

Wings (fig. 28, *c*) with Sc_2 present, ending near mid-length of RS, this condition closely resembling that of genus *Tipula*; R_{1+2} preserved, elongate, three times R_2 ; petiole of cell M_1 long, equal in length to its cell, one and a quarter times the petiole for cell M_2 , consequently cells M_1 and M_2 are wide and shallow.

This fly is closely allied to *Dolichocheza barnardi* sp.n. in general appearance and distribution in the field, but is readily distinguished by the slight difference in wing venation and by the structure of the male hypopygium.

Localities.—Cape Peninsula: Orangezicht (K. H. B.), January 1934; Cape Town (Alexander, 1925a).

Dolichocheza barnardi sp.n.

Fig. 29.

♂: Length 7.5 mm., wing 9 mm. Frontal prolongation of head short, three-quarters the length of head, brownish yellow, nasus inconspicuous, black, clothed with long setae; eyes black. Antennae (fig. 29, *a*) 13-jointed, elongate, three to three and a half times the entire length of head; scape yellow; flagellum dark brownish yellow, first flagellar joint much elongated, ten to eleven times its diameter, cylindrical, one and a half times the second joint which appears abruptly shorter, joints 3-10 elongate-cylindrical, about six times their diameter, gradually becoming shorter, ultimate joint inconspicuous, one-quarter the penultimate, rounded apically; palpi shorter than antennae, only twice the entire length of head and rostrum, ultimate joint twice the length of joints 1-3.

Mesonotal praescutum obscure yellow, the coloration almost obliterated by four brown stripes, the median pair narrowly separated anteriorly, contiguous behind, scutum brown, scutellum obscure yellow, postnotum yellow tinged with pale brown. Pleura yellow, anterior portions of sclerites margined with brown. Legs with coxae

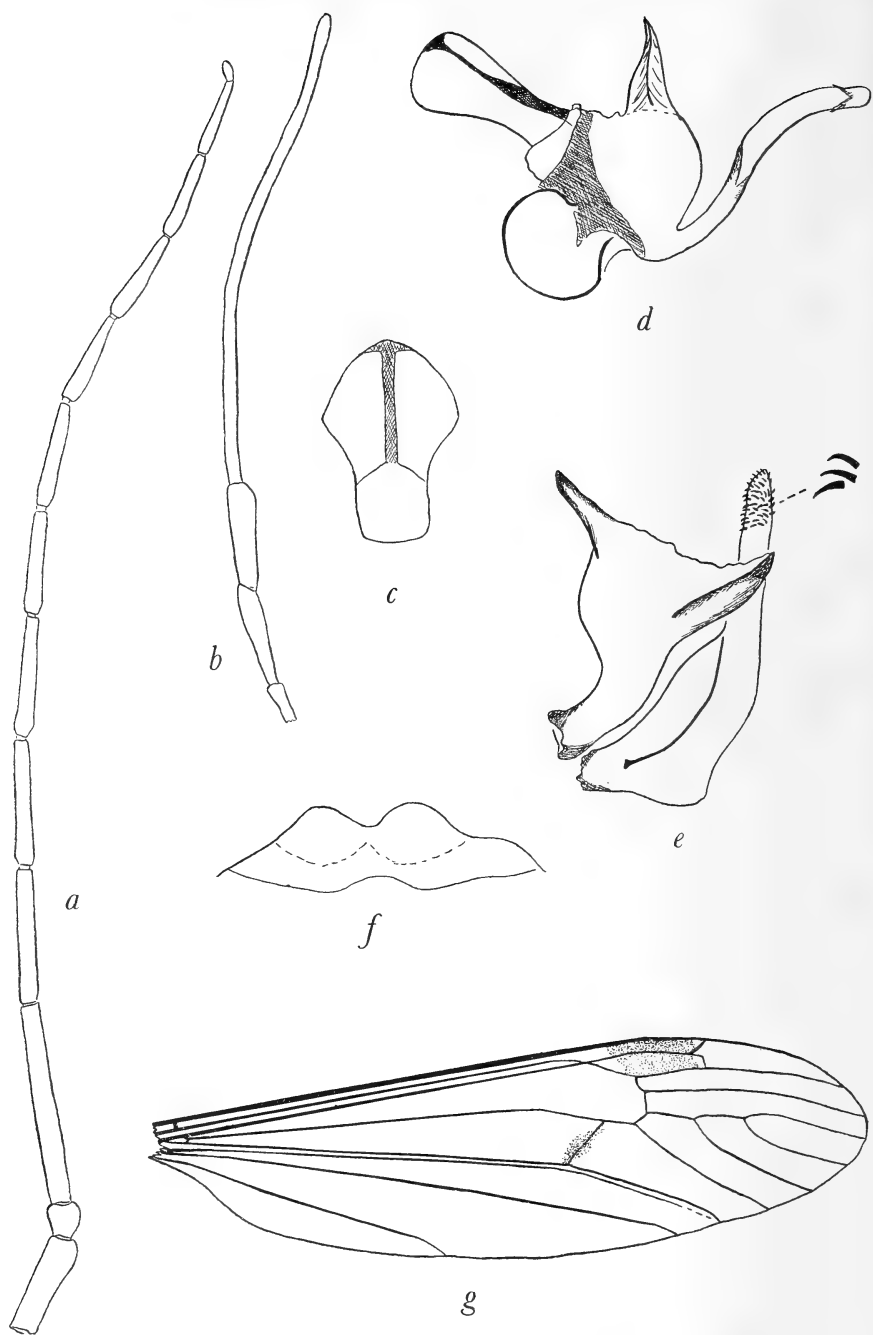


FIG. 29.—*Dolichozeza barnardi* sp.n. *a*, antenna; *b*, maxillary palpus; *c*, "basum"; *d*, penis and aedeagal sheath (lateral view); *e*, outer and inner dististyles (male hypopygium); *f*, caudal margin of ninth tergite; *g*, wing.

and trochanters light yellow, remainder of legs light brown becoming darkened towards tarsi. Halteres elongate, one-half length of the hind femora, yellow, knobs dark yellowish brown, tips paler. Wings (fig. 29, *g*) tinged with pale brown, stigma dark brown, conspicuous white areas before and after stigma, cord seamed with brown, veins dark brown. Macrotrichia occur on veins and in cells R_1 to Cu_1 . Sc_2 ends immediately before origin of RS which is short and transverse, R_{1+2} practically entirely preserved, R_2 strongly arcuated, r-m longer than basal deflection of R_{4+5} , petiole of cell M_1 and petiole of cell M_2 equal, cell M_1 two and a half times the length of either petiole.

Abdomen obscure yellow, anterior and posterior margins of each individual segment darkened with brown, tergites 8 and 9 and sternites 7-8 almost entirely brown. Male hypopygium small, yellow, caudal margin of ninth tergite chitinated, dark brown, produced into two rounded lobes, finely roughened and denticulate (fig. 29, *f*); basistyles clothed with elongate delicate hairs. Spinose lobes at end of ninth tergite absent. Outer dististyle (fig. 29, *e*) somewhat dilated at irregular base, distal portion cylindrical, apex bearing eighty to one hundred minute closely packed acute spicules, numerous elongate setae occur along outer margin; inner dististyle (fig. 29, *e*) a flattened chitinated blade, narrow at base, then dilated to form a shallow Y, the arms of which are slightly produced and subacute; several elongate setae are scattered along the margin and inner surface. Aedeagal sheath short, stout, the slender penis arising from the caudal region of the bulbous base; basal portions of penis twisted through 45 degrees from the horizontal, the basal plate (fig. 29, *c*) long, moderately wide and concave, the basal constriction gradual and slight, median ventral keel fairly deep anteriorly, becoming more shallow basally (fig. 29, *d*); ventral and dorsal plates as in ♂ *hirtipennis*.

Localities.—Cape Peninsula: Echo Valley (K. H. B., C. W. T.), March 1932.

Dolichopeza fluminis sp.n.

Fig. 30.

♂: Length 9-9.5 mm., wing 11-12 mm. Frontal prolongation of head short, one-half the lateral length of head, light yellow; nasus black, short and stumplike, clothed with few long setae; eyes black; vertex dark brown. Antennae (fig. 30, *a*) 13-jointed, moderately



FIG. 30.—*Dolichocheza fluminis*, sp.n. a, antenna; b, wing; c, caudal margin of ninth tergite; d, outer and inner dististyles (male hypopygium); e, penis and aedeagal sheath (lateral view).

elongate, two and a quarter to two and a half times the entire length of head and rostrum; scape yellow; flagellum brown, flagellar joint 1 elongate-cylindrical, six times its diameter, one and a half times joint 2; joints 3-10 gradually becoming shorter, elongate-cylindrical, five times their diameter; ultimate joint small, one-third the penultimate, rounded apically; palpi shorter than antennae, only twice the entire length of head and rostrum, ultimate joint twice length of joints 1-3.

Mesonotal praescutum obscure yellow, the coloration practically obliterated by three brown stripes, median stripe extremely narrow anteriorly, then dilated for remaining three-quarters of its length; humeral angles whitish, bordered anteriorly with brown; scutum, scutellum and postnotum sepia brown. Pleura light obscure yellow, anterior margins of sclerites darkened with brown. Coxae and trochanters pale yellow, remainder of legs dark brown, tips of femora and base of tibiae ringed with white. Halteres dark brown, knobs blackish brown, apical half pure white. Wings (fig. 30, *b*) suffused with light brown, stigma dark brown, conspicuous white area before and beyond stigma, veins dark brown; macrotrichia on veins and in cells R_1 to Cu_1 . Sc_2 ends immediately before origin of RS which is short and transverse, tip of R_{1+2} partially preserved; r-m longer than basal deflection of R_{4+5} ; petiole of cell M_1 two-thirds the length of petiole of cell M_2 ; cell M_1 five and a half times its own petiole, and also three and a half times the petiole of cell M_2 , consequently cells M_1 , M_2 and M_3 appear deep and narrow.

Abdomen obscure yellow, anterior and posterior margins of tergites darkened with brown, the suffusion becoming more pronounced medially on each tergite until tergites 6-8 are almost entirely dark brown, with only the margins yellow; posterior margin of sternites 2-5 narrowly marked with dark brown, sternites 6-8 uniformly covered with dark brown; hypopygium small, light yellow. Caudal margin of ninth tergite chitinised, dark brown, undulate, slightly produced into two rounded lobes, finely roughened and denticulate (fig. 30, *c*); ventral surface of basistyles heavily clothed with elongate setae. The lobes ventrad of the lateral ends of the tergite bear nine to twelve black spicules confined to the caudal margin. Outer dististyle (fig. 30, *d*) not cylindrical, a moderately chitinised flattened blade, narrow basally, then dilated to a wide concave apex, the angles of which are rounded; inner dististyle (fig. 30, *d*) a chitinised curious structure, narrow basally, then dilated, cephalic angle produced into a slender arm, the apex of which is swollen into a flat, thin, rounded

lobe. The slender penis arises from the cephalic region of the bulbous base; these basal portions of penis twisted through 45 degrees from the horizontal; the basal plate (fig. 30, *e*) is wide, moderately long and moderately concave, the median keel deep at apex, then slender and constricted basally; ventral and dorsal plates as in *hirtipennis*.

Localities.—Cape Peninsula: nil.

Cape Province: Groot River (G. A. W., H. G. W.),
February 1936.

Dolichopeza aurantiaca Alex.

Fig. 31, *a-g*.

1921. pp. 212–213, pl. iv, fig. 15 (wing); 1925*a*. p. 41 (in key).

♂: Length 8.8–9.5 mm., wing 9.5–10.5 mm. The following details will supplement Alexander's general description of this fly.

Head orange without markings; eyes black and conspicuous; antennae (fig. 31, *a*) 13-jointed, moderately elongate, two and three-quarters the length of entire head and rostrum; scape yellow; flagellum dark brown; flagellar joint 1 elongate, five times as long as its diameter, one and a half times the second joint; joints 3–6 equal in length, elongate-cylindrical, four times their diameter; joints 7–10 equal in length but each is slightly shorter than joint 6, tending to become fusiform; ultimate joint one-half the penultimate, rounded apically; palpi (fig. 31, *b*) light brown; basal joints pale, decidedly shorter than antennae, being only twice the length of head and rostrum; ultimate joint whip-like.

In female, antennae (fig. 31, *c*) are shorter, only one and three-quarters the head and rostrum; flagellar joint 1 as in male, but twice the length of the second joint; joints 3–5 each slightly shorter than joint 2; joints 6–11 small, slightly fusiform, shorter than joint 5, three times as long as their diameter; palpi as in male.

Thorax, legs and abdomen are almost uniformly orange-yellow to orange-brown, being devoid of dark markings or stripes. Wings (fig. 31, *d*, also figured by Alexander, 1921) with R_{1+2} preserved; petiole of cell M_1 long, one and a half times petiole of cell M_2 ; cell M_1 thus only one and two-thirds its own petiole.

Caudal margin of ninth tergite chitinised (fig. 31, *f*) and forming a

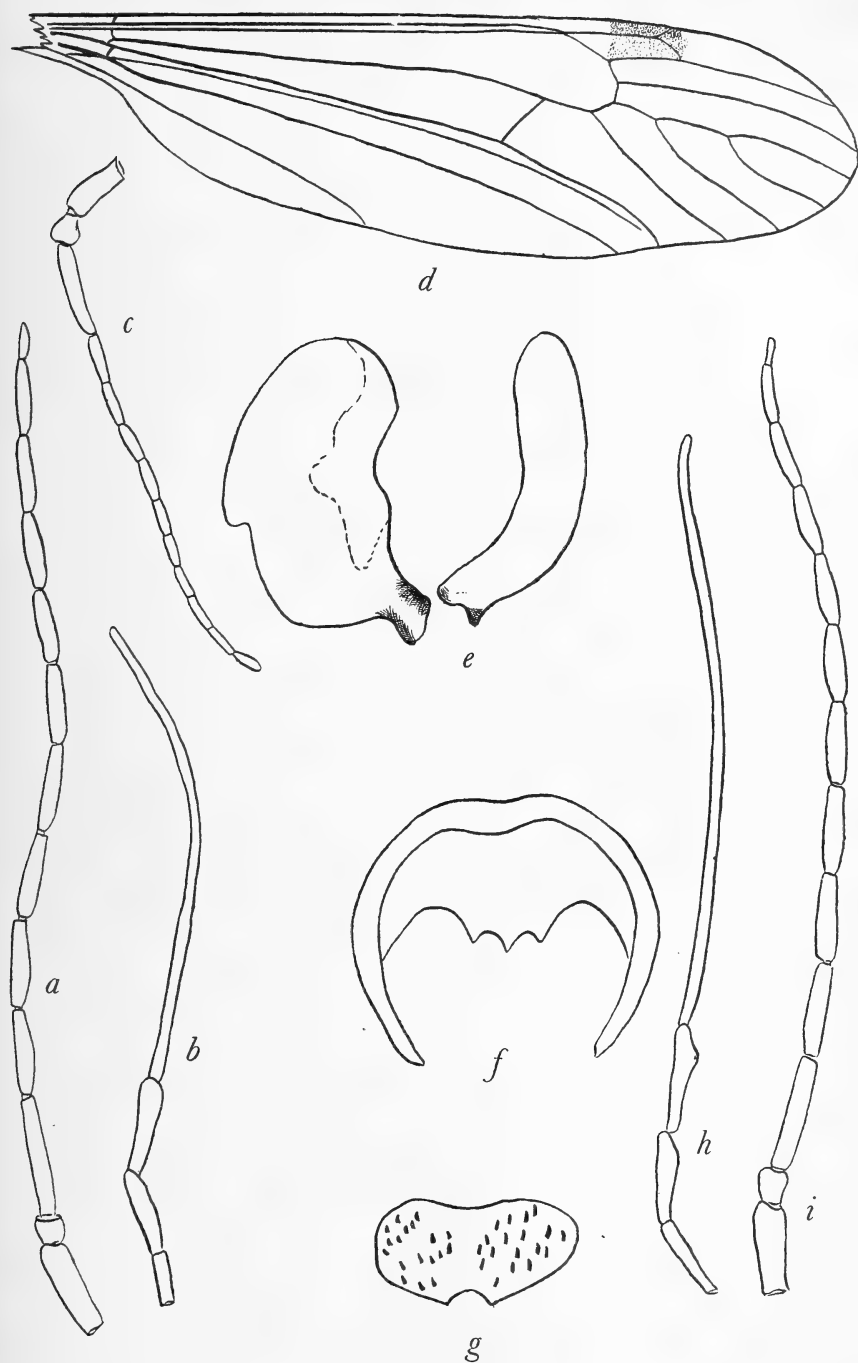


FIG. 31.—*Dolichochepeza aurantiaca* Alex. *a*, antenna; *b*, maxillary palpus; *c*, female antenna; *d*, wing; *e*, outer and inner dististyles (male hypopygium); *f*, ninth tergite (posterior view); *g*, ventral plate on ninth tergite. *Dolichochepeza thoracica* Alex. *h*, maxillary palpus; *i*, male antenna.

horseshoe-shaped band, the median portion of which is depressed ventrad into a wide high plate, its margin bearing three acute median teeth; plates ventrad of each end of ninth tergite are oval, large, completely covered with fifty to sixty black spicules (fig. 31, *g*). Outer dististyle (fig. 31, *e*) short, cylindrical, slightly curved at mid-length; inner dististyle (fig. 31, *e*) equal in length to outer dististyle, a flattened blade, inner margin strongly chitinated, outer margin curved, thin, membranous, apex bluntly rounded. Ventral and dorsal plates as in *hirtipennis*.

Localities.—Cape Peninsula: nil.

Cape Province: Avontuur Road, Knysna (C. W. T.),
November 1936; Harkerville (G. A. W., H. G. W.),
January 1938.

Natal (Alexander).

Remarks.—In its uniform orange-yellow coloration this fly is deceptive and is quite unlike the other members of this genus in the S.W. Cape. Although vein R_{1+2} is entirely preserved, this fly is readily classified by the remainder of the venation and by its typical Dolichopezian hypopygium.

Dolichopeza flavifrons Alex.

Figs. 26, *g*; 32.

1925*a*. pp. 43–44.

♂: Length 9–11 mm., wing 10.3–12.5 mm. Alexander's description of the male, although devoid of figures, is excellent, the portions pertaining to the male hypopygium are herein quoted: "ninth tergite not arcuated, flattened, the margin distinctly projecting as a broad flattened black median lobe, the caudal margin of which is feebly concave, the dorsal surface weakly granulose. Ventrad of the ends of the tergal plate a conspicuous cylindrical lobe, the head dilated and obliquely truncate, here set with abundant black spines, the lateral angle produced caudad."

Outer dististyle (fig. 32, *d*) is cylindrical, moderately long, uniformly covered with numerous elongate setae; inner dististyle (fig. 32, *d*) a flattened blade having the base dilated, beyond which it is abruptly narrowed by a marked circular indentation, along the margin of which occur eight short stiff setae; the remainder of the dististyle curves strongly dorsad to a subacute, strongly chitinated apex, the outer

apical margin armed with stiff elongate setae. Basal portion of penis twisted through 45 degrees (fig. 32, *f*), the actual structure of the various plates as in *hirtipennis*, the keel of the ventral plate being slightly less deep.

Palpi (fig. 32, *b*) slightly shorter than antennae, twice the entire length of head and rostrum, ultimate joint twice length of joints 1-3. Antennae (fig. 32, *a*) 13-jointed, moderately elongate, two and a quarter to two and a half times the entire length of head and rostrum; scape light yellow; flagellum light brown; flagellar joint 1 elongate-cylindrical, six times as long as its diameter, one and one-third times the second joint, which appears scarcely shorter; joints 3-10 gradually becoming shorter, elongate-cylindrical, five times as long as broad; ultimate joint one-half the penultimate, slender, rounded apically.

Female antennae similar in shape and size.

Wing (fig. 32, *c*) has R_{1+2} preserved, but sometimes atrophied (Alexander, 1925); petiole of cell M_1 varies considerably from short (*i.e.* two-thirds) to very short (*i.e.* one-third) compared with length of petiole of cell M_2 ; consequently cell M_1 is five to ten times its own petiole but only three and a half times the petiole of cell M_2 ; cell M_1 , M_2 and M_3 thus appear deep and narrow.

Localities.—Cape Peninsula: nil.

Cape Province: Oudebosch (Lightfoot), December 1920;
(C. W. T., H. G. W.) September 1934.

Larva.—Length 15-17 mm., diameter 2.8-3 mm. Similar in coloration and general structure to *Dolichopeza hirtipennis*, but revealing the following distinguishing features. The four dorsal lobes of spiracular disc (fig. 26, *g*) are unequal in length, the two median lobes being short, fleshy, conical; the dorso-lateral lobes conspicuous, large, stout basally, tapering to slender transparent apices; all four lobes devoid of hairs. The tubercle on each side of the penultimate segment closely simulates the dorso-lateral lobes, thus being longer and more prominent than in *hirtipennis*, and tapering to a slender apex. Antennae of head capsule with basal segment elongate-cylindrical, twice as long as broadest diameter.

Pupa.—Length 9 mm., diameter 2 mm. The female pupae and "shucks" are exactly similar to those of *Dolichopeza hirtipennis*. Unfortunately no male pupa is available for study; it is possible that the lobelike spines of the cauda might provide a distinguishing feature.

Remarks.—Along a stream near the entrance to the dense woods of Oudebosch Mr. Thorne and the author collected numerous larvae

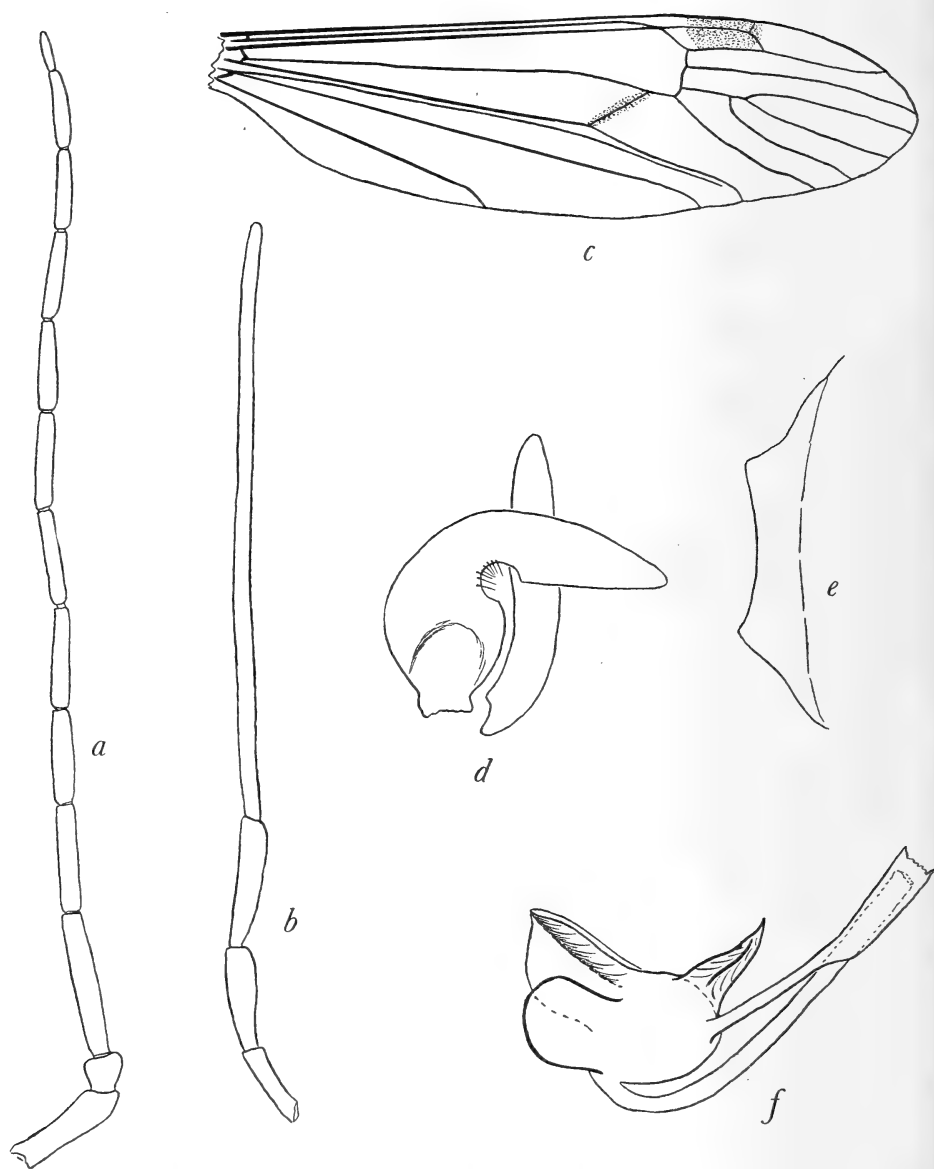



FIG. 32.—*Dolichopeza flavifrons* Alex. *a*, antenna; *b*, maxillary palpus; *c*, wing; *d*, outer and inner dististyles (male hypopygium); *e*, caudal margin of ninth tergite; *f*, penis and aedeagal sheath (lateral view).

of this species (September 1934). These were confined to the moss cushions on the rocks projecting from the water and were not in the moss on the actual banks of the stream.

Dolichopeza thoracica Alex.

Figs. 25, *a-c*; 31, *h, i*.

1925*a*. pp. 47-48.

♂: Length 6.5-7.6 mm., wing 8.3 mm. Alexander's description of the holotype male is figureless. "Male hypopygium more or less incrassated; ninth tergite narrowly margined with chitin, highly arched, viewed caudally appearing -shaped, the ends of this narrow band dilated and bearing a few spicules; ventrad of this outer chitinated margin on either side a conspicuous blackened lobe that is densely spiculate, these spicules continued mesad as a narrow line, meeting on the meson" (see fig. 25, *c*).

"Outer dististyle of moderate length, cylindrical, provided with a few setae. Inner dististyle conspicuously blackened, the outer surface grooved and ridged longitudinally, the appendage directed mesad and then dorsad; apex of inner style irregularly toothed" (see fig. 25, *a*).

The head which is missing in the holotype is as follows: Frontal prolongation of head short, yellow; nasus inconspicuous; vertex darkened with brown; antennae (fig. 31, *i*) 13-jointed, moderately elongate, two and a half times the length of head and rostrum; scape and first flagellar joint yellow, rest of flagellum dark brown; flagellar joint 1 elongate-cylindrical, six to seven times as long as its diameter, one and a quarter to one and a third times the length of the second joint; joints 3-10 gradually becoming shorter, but three times as long as their diameter; joints 5-8 tending to become fusiform; ultimate joint one-half the penultimate, slender, rounded apically; palpi light brown, somewhat shorter than antennae, twice to two and a quarter times the length of head and rostrum; ultimate joint whiplike, twice the combined joints 1-3 (fig. 31, *h*).

Female antennae approximately the same length; similar in shape and coloration.

Wing with petiole of cell M_1 long, one and two-thirds the petiole of cell M_2 , cell M_1 consequently short, only one and a half times to one and two-third times the length of its petiole and almost three times the petiole of cell M_2 ; cells M_1 and M_2 thus appear wide and shallow.

Localities.—Cape Peninsula: nil.

Cape Province: Humansdorp (Tucker), January 1921.

Natal: Cathkin Peak, Drakensbergen (Lawrence),
January 1938.

Genus LONGURIO Loew.

1869. p. 3.

Imago.—Males winged or subapterous, females subapterous, *i.e.* wings usually equal to or less than length of halter (in *L. capicola* wings are twice a halter; in *L. silvester* four times a halter); abdomen of winged males about equal to wing alone, physogastric in all females; verticils of outer joints of flagellum long and conspicuous; nasus frequently bifid; ovipositor valves with smooth margins, chitinised, acicular; male hypopygium simple in structure, deeply V-shaped (dorsal view), the dististyles recurved and lying along basistyles, outer dististyle a flattened blade, inner dististyle armed with a varying number of stout spines (lateral view), apical region prolonged into a strong hook.

Larva.—Form plump, terete. Chaetotaxy often composed of long stiff setae, often absent or reduced. Spiracular disc apparently lobeless at first glance, but closer examination reveals a lobelet laterad of each spiracle and two ventral lobelets (spiracular disc of *L. micropteryx* and *L. minusculus* entirely lobeless, but having a strongly curved chitinised hook caudad of each spiracle). Head capsule retractile, compact, massive, with the posterior incisions shallow; antennae short-cylindrical; apical papilla large, one-third to one-half the basal segment, surrounded by three to six small sensory pegs; mandible produced to one or three apical teeth; maxilla of *Limonian* construction; labrum having two large circular areas with slender papillae on apical surface; hypopharynx consisting of a broad flattened plate with the ventral surface beset with acute setae and with the anterior margin divided into three or five short teeth, each lateral angle of this plate articulating with a strong tapering side plate; mentum broad with five teeth. Anal gills absent, anus usually distended.

Pupa.—Cephalic crest usually conspicuous, of varying shape; head capsule at origin of antennal sheaths produced into large ventrally directed lobes for levering the pupa upwards to surface of soil (except *L. minusculus*); pronotal breathing horns long, cylindrical, usually bluntly rounded apically (except *L. minusculus* and *L. micropteryx*,

where horns are microscopic and bloblike); abdominal segments with subterminal row of spines varying in number; male cauda having tergal sheaths reduced, sternal sheaths large, dorsally curved, each with a ventral lobe; spiracles small, on inner side of dorsal lobes, anterior region of cauda armed with two to eight lobes; female cauda having tergal and sternal sheaths of equal length (except *L. silvester*), the sternal sheaths without any ventral lobe, anterior lobes as in male.

The number of species of *Longurio* frequenting the S.W. Cape is now twelve (new species six), all of which possess subapterous females. Nine complete life-histories and two additional correlated pupae are herein described. The study of the genus has revealed the following remarkable facts:—

(1) Five species (*L. micropteryx*, *chionoides*, *dolichoros*, *flagellata* and *spinosa*) have subapterous males and females, the wings being similar in size and shape in both sexes of the respective series.

(2) Seven species (*L. bonae spei*, *minusculus*, *capicola*, *belloides*, *versfeldi*, *minusculoides* and *silvester*) have normally winged males.

(3) The females of *L. bonae spei*, *minusculoides* and *belloides* are subapterous, while the females of *capicola* and *silvester* are hemipterous. The remaining two females will probably be subapterous judging from the appearance of the un-reared pupae.

(4) The immatures occur in two distinct types of environment: (a) soil beneath the clumps of *Restiaceae* on dry mountain slopes or plateaus, (b) soil beneath a carpet of rotting leaves in dense woods. The S.W. Cape immatures are distributed as follows:—

(a)	(b)
<i>belloides</i>	<i>chionoides</i>
<i>minusculoides</i>	<i>silvester</i>
<i>bonae spei</i>	
<i>dolichoros</i>	
<i>spinosa</i>	
<i>flagellata</i>	
	<i>capicola</i>
	<i>micropteryx</i>
	<i>minusculus</i>

(5) The immature stages of the S.W. Cape species differ vastly in habitat from the solitary life-history described by Alexander (1920a, pp. 990–992) who states that two larvae of *Longurio testaceus* Loew were found “in wet sand in a bog on the top of South Mountains.”

Micropterism.—A comparison of the pupae of winged species with those of subapterous species reveals that the wing pads are similar in every respect. It is consequently difficult to advance any reason for the extensive aberrations which occur in the females and in some males immediately prior to the emergence of the imago. It seems as if some influence or tropism affects the potential imago and restricts the ultimate size of the wings. In some species (*L. capicola* and *L. silvester*) the aberration is slight—the wings being one-half the length of those of the normal males; in others (*L. flagellata* and *L. dolichoros*) the aberration is great, the wings being microscopic and not larger than a halter knob.

In the closely allied genus *Tipula* the females of two species, *T. caffra* and *T. coronata*, are similarly affected—the adults being subapterous and physogastric.

Key to Species of Longurio.

♂ Imagos.

1. Wings of normal length 2.
Wings reduced (not longer than halter) 8.
2. Wings of normal width; cell M_1 present 3.
Wings very narrow, cell M_1 absent *minusculoides*.
3. Wings with a distinct bicoloured effect, due to strong longitudinal suffusions along costal margin, along Cu and anal margin, with pale whitish areas between 4.
Wings almost uniformly coloured; slight darkening may be present along costal margin and along Cu, but bicoloured effect is absent, due to lack of white areas 5.
4. Small forms (10 mm., wing 10–12 mm.); inner dististyle with short, low mesal ridge bearing thirteen spines (fig. 38, f) *bonae spei*.
Large forms (18 mm., wing 18 mm.); inner dististyle long, slender, a prominent mesal ridge with eighteen to nineteen spines (fig. 37, c) *belloides*.
5. Inner dististyle with low mesal ridge bearing six to seven spines, distad of which near origin of apical hook are three to four spines in alignment (fig. 33, c) 6.
Inner dististyle with more than fifteen spines on mesal ridge; no spines near origin of apical hook (fig. 35, c) 7.
6. Thorax orange-yellow, unmarked; pleura unstriped; scape of antenna yellow; flagellum dark brown, yielding a distinct contrast *minusculus*.
Mesonotal praescutum with dark brown confluent stripes; pleura yellowish with dorso-ventral stripe over mesepisternum and mesosternum *silvester*.

7. Large forms (14 mm., wing 16 mm., width 4.5 mm.); due to width of wing apical cells and cell 1st R_1 appear broad (fig. 35, *a*); cell M_1 three and a half times its petiole; cell 1st M_2 twice as long as broad; inner dististyle (fig. 35, *c*) with a long prominent ridge along greater part of its length, bearing twenty-five to twenty-six spines, apical hook relatively short *capicola*.
 Small forms (11 mm., wing 13 mm., width 3 mm.); apical cells and cell 1st R_1 appear narrow (fig. 38, *a*); cell M_1 four to four and a half times its petiole; cell 1st M_2 three times as long as broad; inner dististyle (fig. 38, *c*) broad and short, inner angle below apical hook square, the prominent ridge short, bearing eighteen to twenty-two spines, apical hook relatively long *versfeldi*.
8. Inner dististyle with a raised chitinated protuberance bearing spines, antennae 11- or 12-jointed 9.
 Inner dististyle without any protuberance; antennae 9- or 13-jointed 10.
9. Sixteen to eighteen spines on inner dististyle; protuberance large and conspicuous (fig. 40, *f*); antennae 12-jointed; wings about size of a halter stem *chionoides*.
 About six spines on inner dististyle; protuberance small (fig. 47, *c*); antennae 11-jointed; wings about length of a halter knob or one-half the length of a halter stem 10.
10. Four to five spines on inner dististyle; wings about one-half the size of a halter stem *spinosa*.
 Six spines on inner dististyle; wings about the length of a halter knob *dolichoros*.
11. Inner dististyle long and slender (fig. 43, *c*), with ten spines; antennae 9-jointed, ultimate joint elongate, flagellate; wings microscopic, less than one-half the length of a halter knob *flagellata*.
 Inner dististyle shorter (fig. 41, *c*), with eight to eleven spines; antennae 13-jointed, ultimate joint normal; wings slightly less than one-third the length of entire halter *micropteryx*.

♀ Imagos.

1. Wings equal to or smaller than a halter 3.
 Wings twice or four times the length of a halter 2.
2. Wings about twice length of a halter; ovipositor valves of normal construction *capicola*.
 Wings four times the length of a halter; ovipositor valves reduced, not normal *silvester*.
3. Wings not longer than one-third the length of a halter, usually not longer than a halter knob 4.
 Wings equal to or at least two-thirds the length of a halter 6.
4. Wings longer than the halter knob, about one-third the length of a halter; antennae 13-jointed *micropteryx*.

- Wings not longer than a halter knob, often less; antennae 9- or 11-jointed 5.
5. Wings about the size of a halter knob; antennae 11-jointed *dolichoros*.
 Wings microscopic, less than one-half the length of a halter knob; antennae 9-jointed *flagellata*.
6. Costal margin of wings strongly curved (fig. 40, e), apical portion wide, as long as basal portion; antennae 12-jointed *chionoides*.
 Costal margin not strongly curved, apical portion narrow, long, two and a half to three times the basal portion; antennae 13-jointed 7.
7. Wings almost uniformly suffused with dark brown, with a white diamond-shaped patch near apex; vein R distinct, continued round the apex bearing setae; width of wing almost uniform after its constriction; mesothorax sepia brown *bonae spei*.
 Wings slightly darkened, hyaline, only vein R visible, terminating well before apex of wing 8.
8. Large forms (20 mm.); vein R with thirty to forty setae *belloides*.
 Small forms (11 mm.); vein R bearing twenty setae, a row of ten setae continuous with vein R; width of wing gradually wider after constriction; mesothorax dark yellow *minusculoides*.

Larvae.

1. Conspicuous chitinised hooks on spiracular disc caudad of spiracles 2.
 No hooks on spiracular disc 3.
2. Spiracular disc heavily chitinised between the spiracles; a single large hook behind each spiracle *micropteryx*.
 Spiracular disc white, unchitinised; a pair of hooks of unequal length behind each spiracle *minusculus*.
3. Large forms (above 20 mm., usually 24 mm.) 4.
 Small forms (not reaching 18 mm., usually 15 mm.) 6.
4. Antennae more than twice as long as broad; apical papilla one-half the length of basal segment; hypopharynx with five teeth 5.
 Antennae as broad as long, apical papilla one-quarter the length of basal segment; hypopharynx with three teeth *belloides*.
5. At present not known to occur in Cape Peninsula *capicola*.
 At present only known to occur in Cape Peninsula *chionoides*.
6. Hypopharynx with five teeth *spinosa*.
 Hypopharynx with less than five teeth 7.
7. Hypopharynx with two teeth *silvestor*.
 Hypopharynx with three teeth 8.
8. Length 15-16 mm., diameter 3 mm.; a slight ridge anterior to lateral lobes of spiracular disc; spiracles separated by twice the diameter of a single spiracle *dolichoros*.
 Length 11-12 mm., diameter 2 mm.; no ridge anterior to lateral lobes of disc; spiracles separated by three and a half to four times the diameter of a single spiracle *flagellata*.

Pupae.

1. Pronotal breathing horns small, bloblike, inconspicuous (fig. 42, *a, b*) 2.
Breathing horns large, conspicuous (fig. 39, *c, d*) 3.
2. Cephalic crest low, inconspicuous; lobes at origin of antennal sheaths large, conspicuous (fig. 42, *a, b*); the dorsal lobes at base of each tergal sheath on the cauda is markedly bifid in male and female; armature of spines on abdominal segments as in table, pp. 139, 140 *micropteryx*.
Cephalic crest absent; lobes at origin of antennal sheaths inconspicuous, reduced, not apparent at first; dorsal lobe at base of each tergal sheath on cauda not bifid, tapering to an acute apex; armature of spines on abdominal segments as in table, p. 114 *minusculus*.
3. Each lobe on head capsule at origin of each antennal sheath large and bifid (ventral view), more conspicuous than cephalic crest 4.
Each lobe (if present) at origin of each antennal sheath small and conical; cephalic crest much more conspicuous 5.
4. Male and female with venter of abdominal segments 5-7 having sixteen, fifteen to sixteen, ten spines; female with dorsa of segments 2-7 with 30-32, 30-32, 23-24, 23, 14-16, 9-10 spines *chionoides*.
Male and female with venter of segments 5-7 with 8-9, 8-9, 8-10 spines; female with dorsa of segments 2-7 with 21, 21, 17, 15, 11-12, 9 spines *capicola*.
5. Small forms (8.5-9 mm., diameter 1.5 mm.) *flagellata*.
Large forms (15-18 mm., diameter 3-3.2 mm.) 6.
6. Cephalic crest a high median lobe (ventral view), a high triangular lobe tapering but not curved to an acute apex (lateral view) (figs. 39, *c, d*; 46, *a, b*) 7.
Cephalic crest a high truncate median lobe (ventral view), arising with a strong curve dorsad of origin of antennal sheaths, curving to an acute apex (lateral view) (fig. 47, *g, h*) 9.
7. Cauda practically truncate; tergal and sternal sheaths short, intermingled with armature of lobelike spines *silvester*.
Cauda not truncate; tergal and sternal sheaths projecting far beyond armature of lobelike spines 8.
8. Length 18-20 mm., diameter 3 mm. *belloides*.
Length 11-14 mm., diameter 2 mm. *bonae spei*.
9. Spines comprising armature on dorsa of abdominal segments 2-5 few, i.e. seventeen in male, twenty-two in female *dolichoror*.
Spines more numerous; twenty-eight to thirty-six in male; thirty-two to thirty-six in female *spinosa* and *minusculoides*.

Longurio minusculus Alex.

Figs. 33, 34.

1917. pp. 162-163, pl. xi, fig. 26 (wing); pl. xiii, fig. 51 (hypopygium); pl. xiv, fig. 56 (9th tergite).

♂: Length 8.2-9.6 mm., wing 8.8-10.3 mm. Holotype male well described and figured by Alexander, but additional notes are necessary for exact determination of the species. Outer dististyle of male hypopygium with sparse pubescence, a flattened fleshy lobe, rounded apically; inner dististyle (fig. 33, c) with a low mesal ridge bearing six to seven stout spines, distad of which near the origin of the apical hook are three to four spines in alignment.

Nasus of head not bifid but produced into a rounded hairy apex. The contrast between the yellow scape and the dark brown flagellum of the antennae is striking. Legs reveal the following lengths in millimetres:—

	I	II	III
Femur .	5.2-5.3	5.2-6.3	5.6-7
Tibia .	6-7	5.8-6.8	5.8-7.2
Tarsus .	9.2-9.4	11.5-13	13.2-17.2
<hr/>			
Total .	20.4-21.7	22.5-26.1	24.6-31.4

♀: Unknown, probably subapterous judging from the structure of a single pupa collected in 1938 (see description of immatures), which closely resembles pupae of the other subapterous females of this genus.

Localities.—Cape Peninsula: Table Mountain (K. H. B.), March 1918.

Cape Province: Ruiterbosch (K. H. B., H. G. W.), February 1932; French Hoek Pass (K. H. B., H. G. W.), December 1932; Steenbras (K. H. B.), December 1925; Landdrost (K. H. B., C. W. T., H. G. W.), January 1933; Zuurvlaakte (K. H. B.), November 1932; Hermitage Kloof (G. A. W., H. G. W.), January 1938.

Larva.—Length 18 mm., diameter 3 mm. Colour orange-yellow, often darkened with brown. Form terete, integument devoid of pubescence. Chaetotaxy consists of long stiff setae; thoracic segments with mesal ring of evenly spaced setae, eight across each

dorsum, six across each venter. Setae on abdominal segments gradually become longer and thicker until they reach their maximum on segments 5, 6 and 7. Dorsum of abdomen with eight setae, two near each lateral margin at mid-length; outer seta large and stiff,

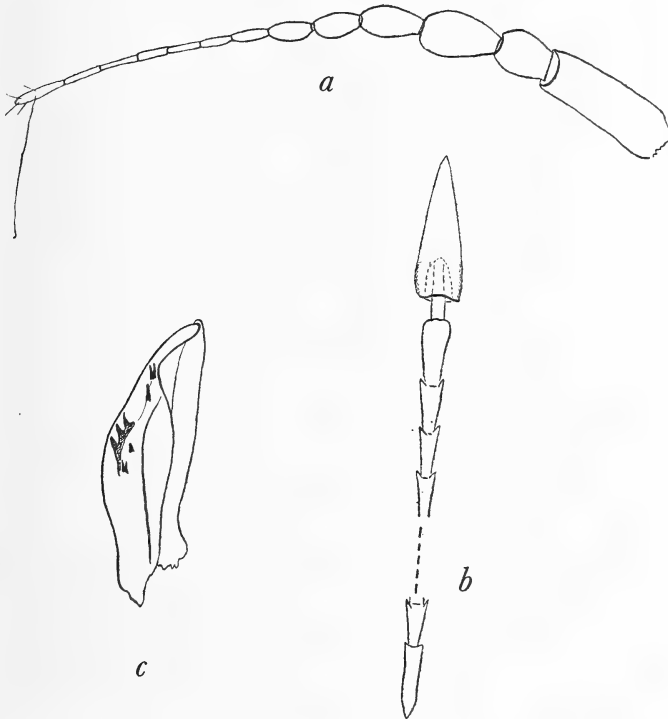


FIG. 33.—*Longurio minusculus* Alex. *a*, male antenna with elongate verticil; *b*, base and apex of verticil further enlarged; *c*, inner and outer dististyles of male hypopygium.

three times the inner, the remaining four setae forming a row near posterior margin, evenly spaced, the outer slightly longer than the inner; pleura with two large stiff setae at mid-length; venter with a posterior row of four pairs of long evenly spaced setae, inner pairs shorter than the others, each outer pair composed of one long and one short seta.

Spiracular disc (fig. 34, *g*) white, without chitination, broader than long, anterior margin undulate, integument surrounding disc mottled with brown blotches and spots, spiracles circular, large, prominent,



FIG. 34.—*Longurio minusculus* Alex. Larva: *a*, mentum; *b*, antenna with disc and apical sensory papillae; *c*, mandible (lateral aspect); *d*, labrum (dorsal view); *e*, maxilla; *f*, hypopharynx; *g*, spiracular disc at caudal end of body (dorsal aspect); *h*, chitinised hooks of disc enlarged (lateral view).

black, separated by twice the diameter of one spiracle; immediately caudad of each spiracle a brown chitinated protuberance, broader than each spiracle and produced dorsad into two stout black hooks (fig. 34, *h*). Laterad of each spiracle on edge of disc three setae, anterior the largest, middle the smallest; laterad of each hooked protuberance a single seta on edge of disc; caudad of each protuberance two setae, one behind the other; further laterad three setae, ventral posterior surface a row of four evenly spaced setae.

Head capsule retractile, broad, compact, massive, with posterior incisions shallow, prefrontal sclerite large and distinct. Antenna (fig. 34, *b*) short-cylindrical, as broad as long, auditory organ apparent at mid-length, apical papilla large, more than half the length of basal segment, conical, surrounded by three to four sensory pegs or papillae. Mandible (fig. 34, *c*) powerful, massive, broad at base, produced into a single broad, bluntly rounded apical tooth. Maxilla (fig. 34, *e*) large, cardo elongate, transverse, tapering, with three setiferous punctures bearing long, tapering, powerful setae; outer lobe chitinated basally, with a prominent short-cylindrical palpus at apex, bearing six to ten minute sensory papillae, a single powerful seta and numerous setalike hairs on mid-region of lobe; inner lobe pubescent, with sensory pegs and two to three powerful apical setae, mid-surface with setalike hairs, lateral surface bearing numerous truncate setae, basal edge with two curved acute setae. Labrum (fig. 34, *d*) large, broad, conspicuous, with four to five setiferous punctures along meso-lateral surface, each puncture bearing a powerful tapering seta; apical surface with two large, circular, chitinated areas having three powerful setae set amid numerous setalike hairs and smaller sensory pegs. Hypopharynx (fig. 34, *f*) consists of a broad flattened plate, anterior margin of which is divided into three broad, short teeth, middle tooth rounded, lateral teeth acute, ventral surface beset with tuft of long acute setae, each basal lateral angle of hypopharynx produced into strong flattened tapering plate. Mentum (fig. 34, *a*) deeply split behind but not completely divided, having five teeth along anterior margin, middle tooth large and powerful.

Pupa.—♀: Length 15 mm., diameter 2 mm. Colour dark yellowish brown, cauda blackened. Cephalic crest absent; ventrad of origin of antennal sheaths two small rounded tubercles with a short stiff seta. Antennae slightly crenulate along basal margin, tapering to slender apices. Mouth parts as in genus.

Thoracic pronotum high, convex. Pronotal breathing horns

microscopic, rounded apically, similar in shape to those of *L. micropteryx*; mesothorax with three to four setae at mid-length. Leg sheaths form a shallow V, fore tarsi extending to end of abdominal segment 3, hind tarsi opposite anterior annulus of abdominal segment 4—the female imago will consequently be subapterous and physogastric.

Chaetotaxy nil.

Abdominal segments subdivided into two annuli, posterior annulus of segments 2–7 armed with a transverse subterminal row of short spines in the following notation: 20, 20, 18, 15, 12, 9; venter of segments 4–7 with the usual anterior and three posterior spines.

♀ cauda: Tergal sheaths and sternal sheaths equal, former slender, bluntly rounded at narrow apices, the latter with tips divergent; at base of each tergal sheath a dorsal lobelike spine, apex acute, inner surface bearing two setae; anterior region of cauda having each dorso-lateral lobelike spine large with three setae on cephalic surface; on each lateral region two large lobelike spines, the more ventral the larger, ventral lobes absent.

Remarks.—In January 1938 Mrs. Wood and the author collected adult males, larvae and one pupa at Hermitage Kloof, which nestles at the foot of the Langebergen Range at Swellendam. The immatures were in the dry rich soil beneath a scanty layer of moist leaves on the steep sides of a wooded ravine, the actual watercourse being some two hundred yards distant. Unfortunately, due to the hot weather encountered on the remainder of this collecting trip, the majority of larvae and the pupa died. There can be little doubt as to the accuracy of the correlation of the immatures with the adults (♂♂) of this species, for the latter which were captured were extremely numerous in this vicinity and were flying rapidly to and fro over the ground seeking the subapterous females; secondly, no other species of *Longurio* is as yet known from this locality.

At the other localities recorded the adult males were collected at high altitudes (2500–5800 feet), either near the summits of the mountain peaks or on elevated plateaus. In these localities the vegetation consists chiefly of *Restio* clumps one to two feet in height intermingled with other low grasses and small solitary shrubs, this form of growth being typical of most of the S.W. Cape mountain summits.

Longurio capicola Alex.

Figs. 35, 36.

1921. pp. 214–215.

♂: Length 14–16 mm., wing 16 mm. Holotype male well described but not figured by Alexander.

Wings (fig. 35, *a*) almost uniformly suffused with strong yellowish brown, costal and subcostal cells darker, a trace of dark brown forming an indistinct longitudinal stripe along Cu_1 , but no white areas are present—bicoloured effect of wing absent. Outer dististyle as in genus; inner dististyle (fig. 35, *c*) short, wide, having a prominent basal chitinated ridge with twenty-five to twenty-six black spines. Legs reveal following lengths:—

	I	II	III
Femur .	8.5–9	8.8–10	11–12.8
Tibia .	9.8	10–9.8	11–12.8
Tarsus .	15	18–19	29–31
<hr/>			
Total .	33.3–33.8	36.8–38.8	51–56.6

♀: Hemipterous. Length 18 mm., wing 4 mm. Frontal prolongation of head reddish brown, as long as lateral diameter of head, nasus bifid, each bifurcation clothed with long yellowish hairs; palpi brown, ultimate joint as long as the previous three. Head dark reddish brown, vertical tubercle conspicuous; eyes black, small, widely separated; antennae (fig. 35, *b*) as in male, light yellowish brown, 13-jointed, scapal joint 1 cylindrical, three times as long as broad; scapal joint 2 globular; flagellar joints 1–2 equal, elongate-fusiform; joints 3–6 shorter, similar in shape to joints 1–2; joints 7–9 equal, shorter than joints 3–6, cylindrical; ultimate joint inconspicuous, buttonlike; penultimate joint fusiform, wider and longer than the previous joint.

Prothorax distinct, prominent, dark reddish brown. Mesonotal praescutum unicolourous, chestnut brown (differing vastly from that of male, where the dark brown stripes are conspicuous against the light yellowish-brown background); pleura dark brown; halteres yellowish brown, knob whitish; wings a miniature of those in male, similar in coloration and venation; two to two and a half times the length of the halteres; legs short and stout, yellowish, fore femora

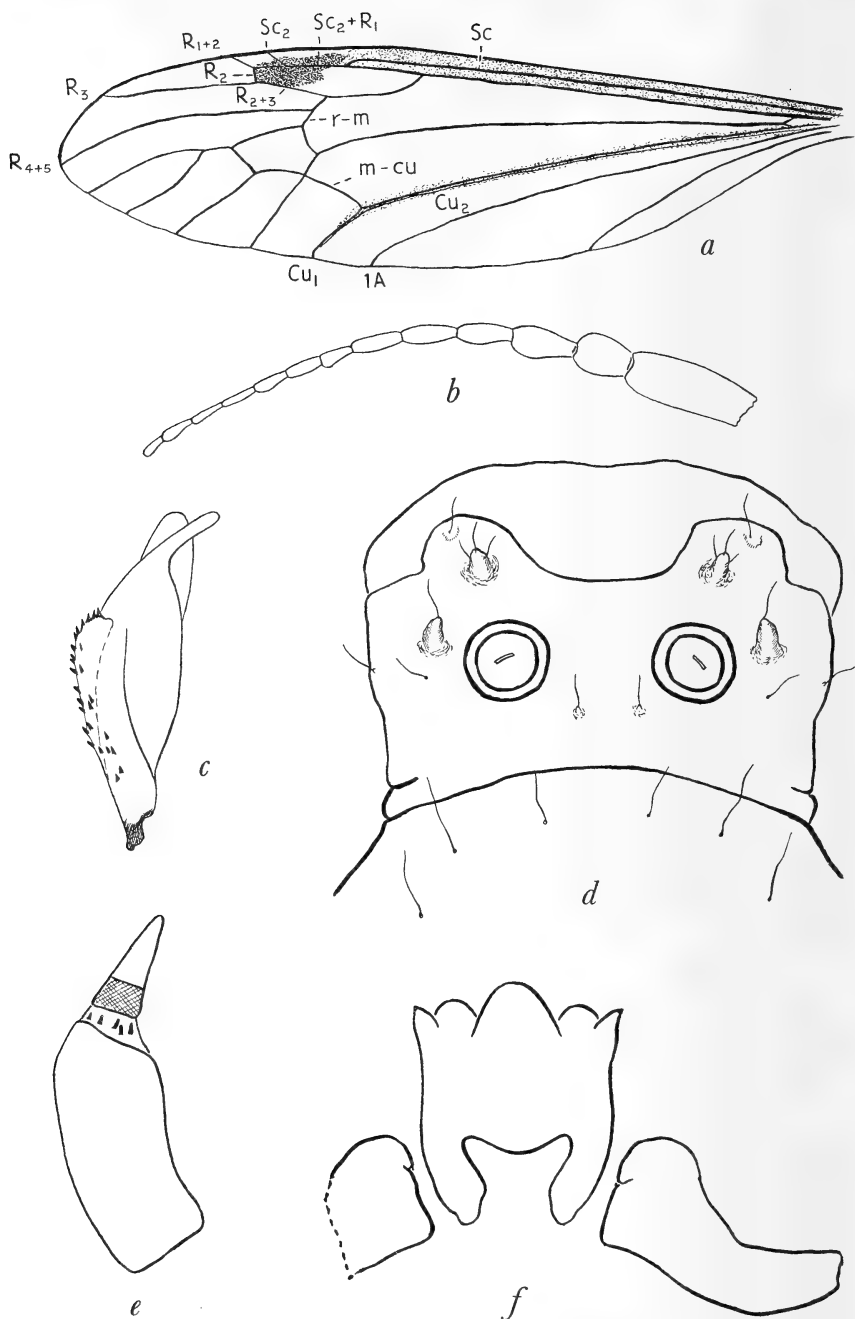


FIG. 35.—*Longurio capicola* Alex. Imago: a, wing; b, male antenna; c, inner and outer dististyles of male hypopygium. Larva: d, caudal end of body showing spiracular disc (dorsal aspect); e, antenna with sensory papillae and sculptured apical segment; f, hypopharynx.

clavate, much blackened apically, remaining femora only slightly darkened apically.

	I	II	III
Femur .	4	4	4.2
Tibia .	4	5.5	5
Tarsus .	5.5	5.5	8.2
<hr/>			
Total .	13.5	15	17.4

Abdomen swollen, reddish brown with yellow pubescence, the black eggs beneath giving a spotted effect; ovipositor valves dark reddish brown, large and strong.

Localities.—Cape Peninsula: nil.

Cape Province: Oudebosch (Lightfoot), December 1920; (C. W. T., H. G. W.) January 1933 and 1934; (G. A. W., C. W. T., H. G. W.) September 1937; River Zonder End Peak (K. H. B.), January 1919.

Larva.—Length 24 mm., diameter 4 mm. Colour dull fawn-yellow, pleural regions of abdomen darkened by alimentary contents showing through the thin integument. Body plump, terete.

Chaetotaxy consists of numerous long stiff setae, blackened at their origin. Prothorax with a row of six setae along edge of upper lip and four lateral setae on either side, four evenly spaced setae along edge of lower lip; a mesal row of eight dorsal, two lateral and four ventral setae; meso- and metathorax with an anterior row of eight dorsal, two pairs of pleural and four ventral setae; abdominal segment 1 with an anterior row of six evenly spaced dorsal setae, three pleural setae, one anterior to the others, and four pairs of ventral setae; abdominal segments 2–7 subdivided into three annuli, the setae being confined to the posterior annuli, consisting of six dorsal setae, each outer seta cephalad of the others, two pleural setae, and eight ventral setae, an outer pair and four middle evenly spaced setae.

Anal gills blown out in majority of specimens into an enormous white bulbous sac, sharply constricted at origin from the last abdominal segment. Ventral surface of bulbous sac with four setae, dorsal surface (fig. 35, *d*) with the two large circular spiracles separated by one and a half times the diameter of one spiracle, stigmal ring dark reddish brown, inner region paler, yellowish brown; adjacent to each spiracle are two short, white, fleshy, fingerlike lobes, one caudad and one laterad of each spiracle, the latter lobes bearing a single apical seta, the former lobes with three minute setae; posterior

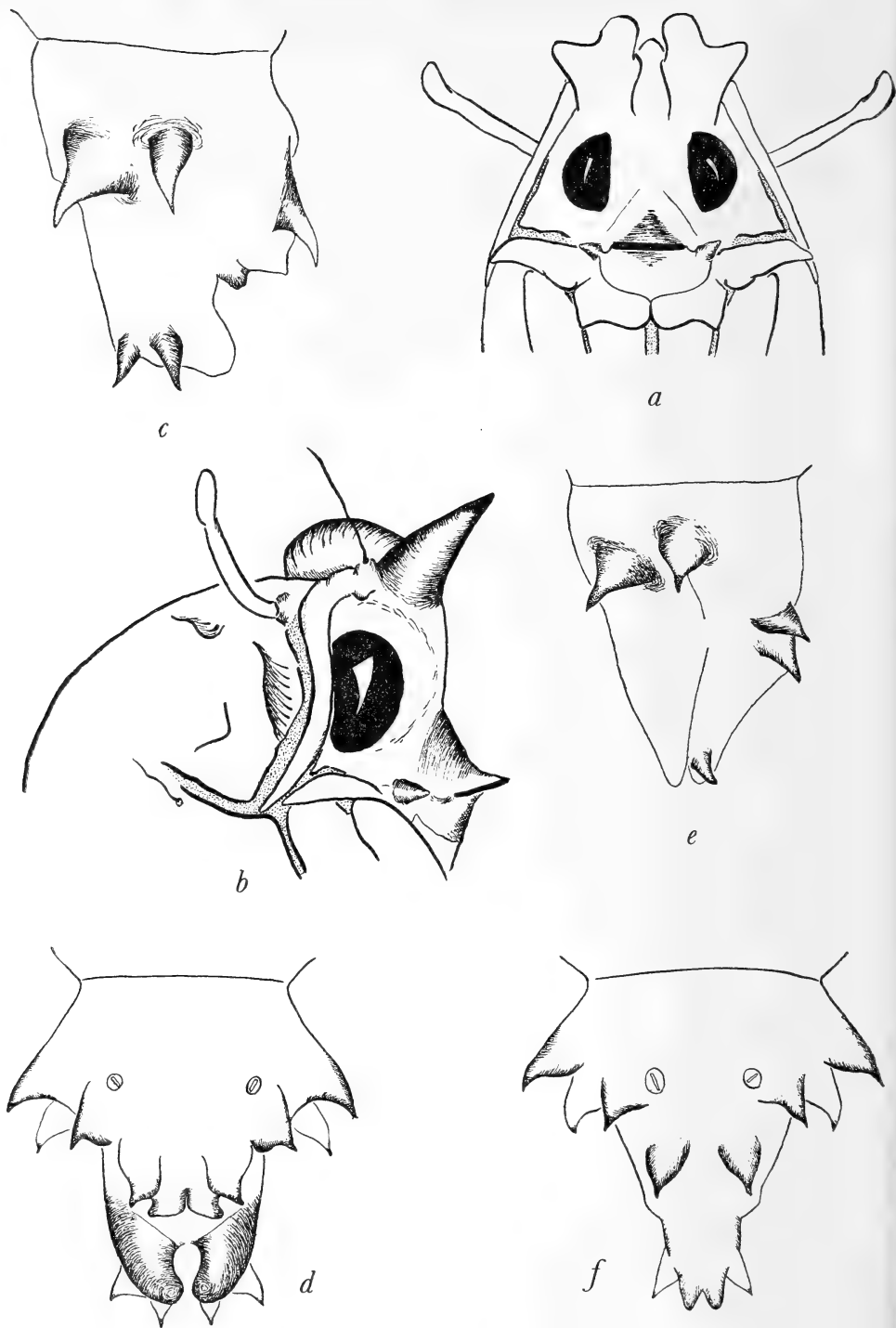


FIG. 36.—*Longurio capicola* Alex. Pupa: *a*, ventral aspect of head; *b*, lateral aspect; *c*, male cauda (lateral view); *d*, male cauda (dorsal view); *e*, female cauda (lateral view); *f*, female cauda (dorsal view).

to each caudal lobe two setae, immediately cephalad of each lateral lobe one seta, laterad of which is another seta; anterior to each spiracle a seta.

Head capsule of *Longurian* type. Antenna (fig. 35, *e*) two and a half to three times its broadest diameter, slightly curved, narrow at origin, swollen towards apex; auditory organ at mid-length; apical conical papilla sculptured at base, slightly less than one-half the length of basal segment, surrounded by five to six minute sensory pegs. Mandible broad at base, produced into a single apical tooth. Hypopharynx (fig. 35, *f*) with anterior margin of flattened plate divided into five teeth; middle tooth the largest, broad, bluntly rounded; outer teeth less broad, slightly smaller but more acute than the inner.

Pupa.—Length 18–20 mm., diameter 2·8–3·1 mm. Colour dark amber-brown, breathing horns slightly darker at tips.

Cephalic crest a median curved ridge, on either side of which is a single tuberculate seta (fig. 36, *b*). At the origin of each antennal sheath the front of the capsule is produced into a large chestnut-brown bifid, ventrally directed lobe, the inner bifurcation of each longer than the outer, apices bluntly rounded (ventral view), sharply pointed (lateral view) (fig. 36, *a*, *b*). Antennal sheaths with three small conical lobes at origin, sinuous at mid-length, tapering to slender apices, ending beyond tips of maxillary palpi by a distance equal to one-half the length of these palpal sheaths (fig. 36, *b*). Labrum with anterior margin produced into a strong transverse ventrally directed ridge (fig. 36, *a*, *b*); labial lobes rectangular, postero-lateral angles of each produced slightly into a bluntly rounded apex; maxillary palpi curved, short, stout, not recurved at the somewhat narrowed tips. Abdomen much swollen. Thoracic pronotum low and mesothorax convex, the latter with a pair of long setae on either side of the median line opposite origin of wing pad; metathorax narrow with two setae near each lateral margin. Wing pads reaching end of abdominal segment 2, with the typical *Longurian* venation. Leg sheaths of male elongate, fore tarsi extending to middle of abdominal segment 5, middle tarsi to middle of segment 6, hind tarsi almost to end of segment 7; of female short, ending opposite end of abdominal segment 3, hind tarsi slightly longer.

Pronotal breathing horns (fig. 36, *a*, *b*) slender, cylindrical, with apex slightly expanded, outer margin finely crenulate.

Dorsal portion of abdominal segment 1 with row of eight long setae and an additional seta at axil of each halter pad. Abdominal

segments 2-7 of male and female subdivided into two narrow anterior and a posterior annulus as wide as the former two; posterior annuli having a subterminal transverse row of stout, acute, caudally directed spines, extending almost to the pleural region in the following dorsal notation: 21, 21, 18, 14, 12, 9; each row interspaced with six to eight elongate tuberculate evenly spaced setae, the outer setae situated at the end of the row of spines, slightly cephalad of which is an additional seta; venter of segments 5-7 with a subterminal row of spines in the order: 8, 8, 10; at the end of each row there occur two to three elongate setae, in mid-region near each lateral margin two additional setae, venter of segments 3-4 with six setae, a pair near each postero-lateral angle, cephalad of each pair an additional seta; pleura of segments 2-7 with the usual anterior and the three posterior spines carrying elongate setae; cephalad of the latter group of spines a microscopic black spiracle.

♂ cauda (fig. 36, c, d): Tergal sheathlets inconspicuous, cephalad of which are two broad lobes, each lobe having an acute apex, sternal sheaths broad, thick, slightly curved dorsally to rounded apices, ventral surface of each with two basal lobes, apically spines; anterior region of cauda with a dorsal chitinised lobe and a long seta near each lateral margin, inner basal surface of lobe with a large black spiracle; on each lateral region of cauda two large setiferous lobelike spines, acute apically; ventral lobes absent.

♀ cauda (fig. 36, e, f): Tergal and sternal sheaths short, of equal length, the former tapering to slender rounded apices, having each lateral surface near the apex produced into a large conical, acute lobe; sternal sheaths fused almost to the bluntly rounded apices; lobes and setae on anterior region of cauda as in male.

Remarks.—At Oudebosch Mr. Thorne and the author have on three occasions collected larvae and pupae of this species. Near the entrance to the forest region is a clearing some fifty yards square hemmed in by dense luxuriant undergrowth. The tops of the tall surviving trees in the clearing form a thick canopy overhead, excluding the sunshine and rendering the humid atmosphere gloomy and depressing. The soil is covered by a thick carpet of rotting leaves three to four inches deep, from which arise solitary clumps of short grass. In this confined space have been found *Limonia subapicalis*, *Limonia libnotina*, *Teucholabis nova*, *Longurio capicola* and *Nephrotoma petiolata*. Adult males of *Longurio capicola* are to be taken while they rest on the grasses or leaves with their wings at right angles to the body and their long slender legs widespread.

The larvae of this species burrow to a depth of nine to twelve inches in the compact soil, feeding on the rootlets of the trees. During the early summer months, when the soil tends to become dry at that depth, the larvae form a small chamber or compartment by twisting round and round, the walls of the chamber becoming smooth and polished. Prior to pupation the larvae burrow upwards and rest one-half to three-quarters of an inch beneath the superficial layer of leaves. Here pupation occurs, the adults emerging in fourteen to seventeen days. The strong bifurcate lobes on the head capsule enable the pupae to pull themselves up through the small plug of soil and leaves, the anterior part of the pupal "shucks" from the ends of the tarsal sheaths remain projecting from the soil between the leaves.

In a small patch of soil adjacent to the above-mentioned habitat were found immatures of *Nephrotoma petiolata*. These larvae were within three inches of the surface of the soil and did not intermingle with the larvae of *Longurio capicola*, although they exist on a similar diet.

Dr. Barnard (January 1919) captured three adult males on the River Zonder End Peak at 5400 feet. The vegetation of this locality is typically mountainous (see notes on *Longurio minusculus*), the immatures probably frequent the soil beneath the *Restio* clumps.

Longurio belloides Alex.

Fig. 37.

1921. pp. 215-216.

♂: Length 18-20 mm., wing 18-19 mm. Alexander's description of the holotype male is good.

Nasus distinctly notched by a deep U, each bifurcation clothed by long black hairs; ultimate joint of palpi subequal to joints 2 and 3 combined; vertical tubercle of head prominent, not as conspicuous as in *Longurio capicola*. Antennae (fig. 37, *b*) short, extending to tips of palpi; 13-jointed; flagellar joint 1 pedicellate; joints 2-8 elongate-oval, gradually becoming shorter; joints 9 and 10 cylindrical; ultimate joint rounded apically.

Frequently, the four stripes on the light brown mesonotal praescutum are absent, the lateral regions being darkened with dark brown. Wings (fig. 37, *a*) having a bicoloured effect of brown and

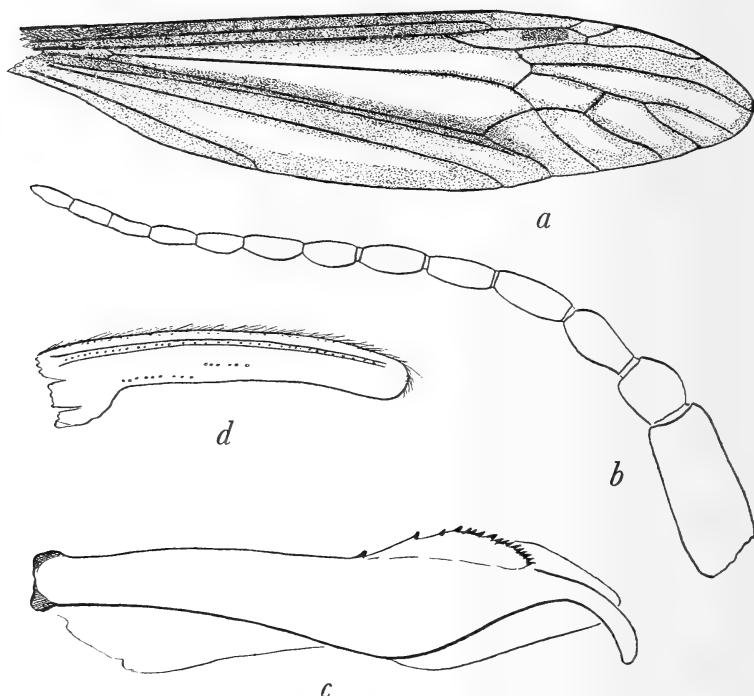


FIG. 37.—*Longurio belloides* Alex. *a*, wing; *b*, male antenna; *c*, inner and outer dististyles of male hypopygium; *d*, wing of female.

white, the brown suffusions similar in distribution to those of *Longurio capicola*; petiole of cell M_1 one-half the length of cell. Legs reveal the following lengths:—

	I	II	III
Femur .	9-10.3	10.2	11.5-12.2
Tibia .	10.8-13	10.5-12	12.5-15.8
Tarsus .	16-18	20-24	25-32
Total .	35.8-41.3	40.7-46.2	49-60

Inner dististyle of male hypopygium (fig. 37, *c*) long, slender, a prominent ridge at mid-length terminating at origin of apical hook and bearing eighteen to nineteen black spines.

♀: Length 20-21 mm., wing 2.5 mm., ovipositor 5 mm. Frontal prolongation of head yellowish brown, as long as lateral diameter of head; nasus slightly bifid, clothed with long brownish hairs; palpi dark brown; ultimate joint one and a half times the penultimate;

head dark yellowish brown, vertical tubercle conspicuous; eyes large, black. Antennae short, extending to ends of short palpi, dark yellowish brown, scape lighter; 13-jointed, structure of flagellar joints as in male but tend to be somewhat thicker.

Entire thorax and legs dark yellowish brown, mesonotal praescutum devoid of markings; wings (fig. 37, *d*) light yellowish brown, one and one-third the length of halteres, moderately wide at origin, then abruptly constricted, uniformly narrow for remainder of length, apex rounded, costal margin straight and bearing numerous stout setae, vein R strong and prominent, terminating before apex, bearing thirty to forty macrotrichia, halteres dirty white. Legs as follows:—

	I	II	III
Femur .	5.5-6	7-7.5	8-8.5
Tibia .	5.5-6.5	7-8	9-10.5
Tarsus .	6-7	6.5-7	6-8
<hr/>			
Total .	17-19.5	20.5-22.5	23-27

Colour of abdomen as in male, ovipositor dark reddish brown, valves elongate, acicular, equal to last three segments of abdomen. Older females are unicolourous, being dark reddish brown, the abdomen becoming greatly distended by the mass of black eggs which is clearly visible through the transparent pleurites.

Localities.—Cape Peninsula: nil.

Cape Province: River Zonder End Peak (K. H. B.), January 1919; Great Winterhoek Peak (K. H. B.), February 1934; (K. H. B., C. W. T.) January 1939; Babylons Tower (K. H. B., C. W. T.), March 1939.

Larva.—Length 22-25 mm., diameter 4 mm. Colour dull yellowish brown to dark brown, integument opaque. Body plump, terete.

Chaetotaxy consists of short stiff setae. Prothorax with a row of six dorsal setae along anterior margin, the two outer setae on either side placed close together, a row of eight mesal setae, each outer three placed close together; four pleural setae, two anterior and two posterior; eight ventral setae, four anterior and four posterior; mesothorax with six dorsal setae, two lateral and eight ventral setae along anterior annulus; metathorax with eight dorsal, two lateral and eight ventral setae; abdominal segments 2-7 subdivided into three annuli, the setae being confined to posterior annulus, consisting of six dorsal setae, each outer two cephalad of the others, the two pleural setae and eight ventral setae arranged in pairs. Anal gills

blown into an enormous dirty white bulbous sac, constricted at origin from last abdominal segment.

Spiracular disc with two circular spiracles separated by three times the diameter of one, stigmal ring reddish brown, inner region black; ventral lobes the largest, round, inner surface marked with yellowish-brown triangle, apex bearing two short stiff black setae, one caudad of the other; lateral lobes minute and fleshy, bearing a single short seta; anterior of each spiracle is a seta borne on a minute tubercle which might be considered as the microscopic dorsal lobe of disc.

Head capsule as in *Longurio minusculus*. Antenna short-cylindrical, as broad as long, apical papilla small, about one-quarter the length of basal segment, conical, surrounded by three sensory pegs. Mandible produced into a broad apical tooth, having an additional shorter dorsal tooth.

Pupa.—Length 18–20 mm., diameter 3 mm. Colour light yellowish brown, breathing horns black, cauda chitinised. Cephalic crest similar to that of *Longurio bonae spei*. Thorax depressed similarly to *Longurio capicola*.

Chaetotaxy nil. Abdominal segments subdivided into two annuli, posterior annulus having the subterminal transverse row of spines in the following notation:—dorsa of segments 2–7 with 22, 25, 21, 12–18, 15, 7–8 spines, venter of segment 3 with a spine on either side of leg sheaths, segment 4 with three pairs of spines, segments 5 and 6 with nine spines, segment 7 with seven spines.

♀ cauda as in female *Longurio dolichoros*, tips of sternal sheaths divergent.

Remarks.—In January 1919 Dr. Barnard collected one adult male on River Zonder End Peak (5400 feet) together with three adults of *Longurio capicola*. On the Great Winterhoek Mountain (6000 feet), in February 1934, he collected three adult males and one female pupal “shuck.” The latter was found projecting from the dry soil at the base of a grass poll sheltered by a low ridge of rock. At that time there was little doubt as to the correlation of the pupa to the imago, for the “shuck” revealed the typical characteristics of the genus and differed clearly from the pupa of the closely allied species *Longurio capicola*.

The Winterhoek locality was revisited in January 1939 by Dr. Barnard and Mr. Thorne, who collected from the soil around a *Restio* clump twenty larvae and eleven pupae, from which males and females were reared, the correlation thus being further confirmed.

In March 1939 on the summit of Babylons Tower they found six

larvae and fourteen pupae, from which were bred six male and one female imagos.

The larvae found in these two localities are easily distinguishable from those of *Longurio capicola* in the details of the head capsule and by the length of the chaetotaxy.

Longurio versfeldi sp.n.

Fig. 38, *a-d*.

♂: Length 11 mm., wing 13 mm., width 3 mm. Head dark brown, eyes black, nasus slightly produced, not bifid, clothed with long black hairs, vertical tubercle inconspicuous, almost absent, antennae and palpi (fig. 38, *b, d*) dark brown, former twice the length of palpi, 13-jointed, scapal joint 1 cylindrical, scapal joint 2 subglobular, flagellar joint 1 slightly clavate, joints 2-5 equal, about one-third shorter than previous joint, fusiform, joints 6-10 equal in length, gradually becoming less narrow and less fusiform, assuming a cylindrical shape in joints 9 and 10, all being one-quarter shorter than joint 5, ultimate joint slightly longer than penultimate joint, tapering to blunt apex.

Pronotum yellowish brown. Mesonotal praescutum dark yellowish brown with three blackish-brown stripes, almost confluent behind, middle stripe split by a thin pale vitta, scutal lobes blackish brown; pleura pale yellowish brown. Wings (fig. 38, *a*) almost uniformly coloured with pale yellowish brown, this suffusion slightly darker along costal margin to stigma and along length of Cu to m-cu, latter stripe narrow, not as prominent as in species with the bicoloured wing, venation similar to that of *Longurio belloides*, RS slightly longer, petiole of cell M_1 shorter, one-quarter to one-fifth of cell M_1 . Halteres pale yellowish brown. Legs of same colour, tips of femora and tibiae darkened, lengths as follows:—

	I	II	III
Femur .	7.5	7	8.2
Tibia .	7.2	6	8.8
Tarsus .	15	14	25
<hr/>			
Total .	29.7	27	42

Abdomen dark blackish brown, sternites paler, pleura whitish, hypopygium yellowish, short; basistyles short and stout; inner

dististyle (fig. 38, c) short, broad; inner angle prior to origin of apical hook truncate; outer margin with a short raised protuberance at

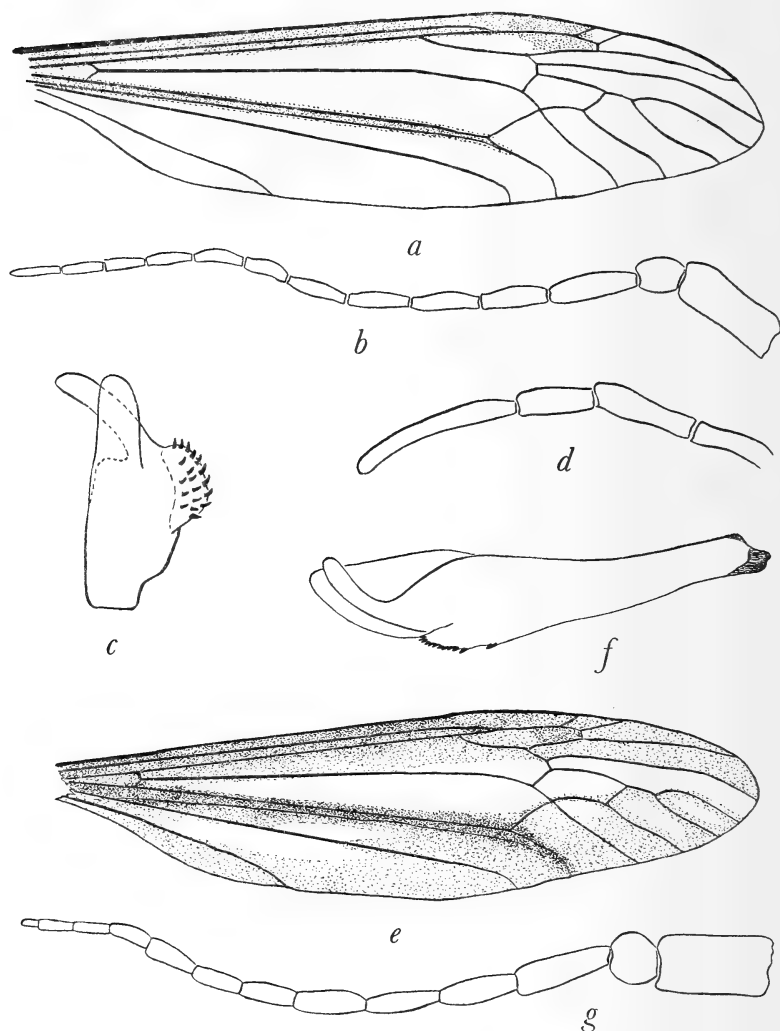


FIG. 38.—*Longurio versfeldti* sp.n. a, wing; b, antenna; c, outer and inner dististyles (male hypopygium); d, maxillary palpus. *Longurio bonae spei* (Bergroth). e, wing; f, inner dististyle; g, male antenna.

base of apical hook, bearing eighteen to twenty-two chitinised spines; apical hook relatively long.

♀: Unknown, possibly subapterous.

Localities.—Cape Peninsula: nil.

Cape Province: Voorkoeden Farm, Caledon (Versfeld),
May 1935.

Remarks.—Dr. M. Versfeld reported "adults flying about in great numbers at farm Voorkoeden at the foot of the Zwartberg Mountain, Caledon, on 23–26 May 1935."

Two subsequent visits to this locality by Mr. Thorne and the author in April and May 1938 failed to yield either adults or immatures, although the most typical environment—the stony slopes with *Restio* clumps—was examined thoroughly. On the first visit many adults of *Longurio bonae spei* were taken while they flitted from clump to clump of *Restio* in their short low flight.

On the second visit one pupa and some seventy larvae of *Longurio flagellata* were dug from the dry soil beneath the scanty grass near an overhanging rock.

Longurio bonae spei (Bergroth).

Figs. 38, *e-g*; 39.

1888. pp. 138–139 (*Tipula*).

1917. Alexander, p. 163, pl. xi, fig. 25 (wing); pl. xiii, fig. 48 (hypopygium); pl. xiv, fig. 55 (9th tergite).

♂: Length 10.2–11 mm., wing 12.3–12.5 mm. Alexander figured the wing and male hypopygium, showing and stating five to six black spines to be present on the "pleural appendages."

Male hypopygia, cleared and loosened in KOH for accurate examination (fig. 38, *f*), reveal that the inner dististyle is long and slender with a short, low mesal ridge, terminating before the origin of the apical hook, bearing thirteen short black spines.

Antennae (fig. 38, *g*) with scapal joint 1 three times as long as broad, scapal joint 2 subglobular, flagellar joint 1 slightly clavate, joints 2–4 equal in length, elongate-fusiform, joints 5–7 equal, shorter, more dilated, joints 8–10 equal to previous joint in length, cylindrical, thus differing from the female, ultimate joint cylindrical, rounded apically, the line of separation from the penultimate joint often difficult to detect even under high magnification.

Wings (badly shaded in Alexander's figure) with strong dark brown suffusions, similar in distribution to those of *Longurio belloides*; costal

region as far as the radial vein and vein R_{4+5} dark brown, except for a small white area anterior to the forking of vein M; the longitudinal stripe along Cu darker brown, this suffusion continued round to meet

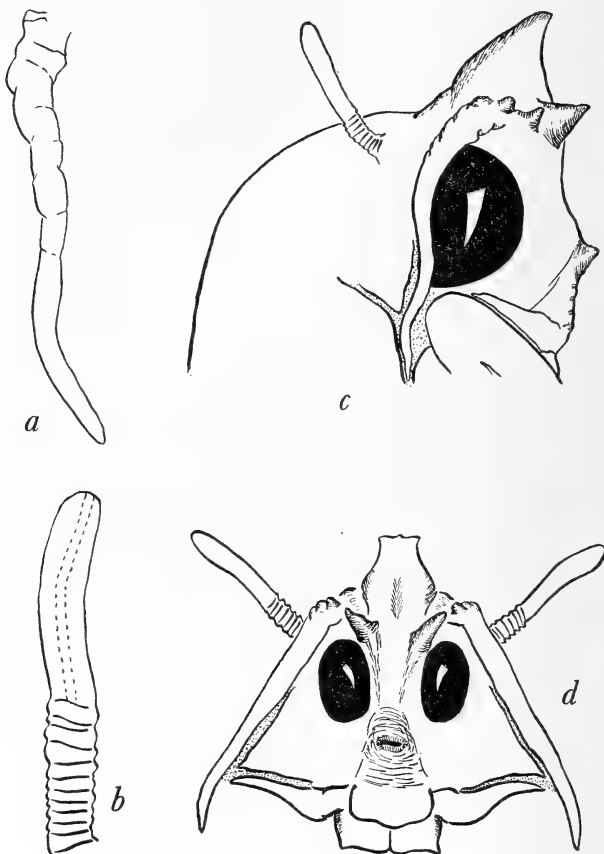


FIG. 39.—Pupa of *Longurio bonae spei* (Bergroth). *a*, antennal sheath; *b*, pronotal breathing horn; *c*, head and thorax (lateral view); *d*, head (ventral view).

the costal suffusion, leaving a white stripe in cells M, 1st M_2 and the anterior parts of cells R_5 , M_3 and M_5 ; anal region with lighter brown suffusion, leaving a small white stripe in the basal and mid-area of cell 1A, entire wing yielding a bicoloured effect (fig. 38, *e*).

Mesonotal praescutum dark brown with darker stripes. Abdomen from segment 3 dark blackish brown. The entire body of living specimens is coated with a silvery dust or bloom. Legs as follows:—

	I	II	III
Femur .	5-5.5	7.6	9.1
Tibia .	?	8.6	11.4
Tarsus .	?	10.5	14
<hr/>			
Total .	?	26.7	34.5

♀: Subapterous. Length 9-10 mm. Frontal prolongation of head dark yellowish brown, as long as lateral diameter of head; nasus bifid, each bifurcation clothed with long yellowish hairs; palpi dark brown, ultimate joint twice the length of previous joint and two-thirds the length of joints 2 and 3 combined; head blackish brown, the vertical tubercle conspicuous; eyes large, black; antennae dark brown, 13-jointed, scapal joint 1 four times as long as broad, scapal joint 2 subglobular, flagellar joint 1 clavate, joints 2-7 almost equal in length, elongate-fusiform, joints 8-9 elongate-cylindrical, joint 8 twice the length of joint 9 and equal to joint 7, penultimate joint one and a half times the previous joint, fusiform, ultimate joint bulbous, inconspicuous, the constriction often difficult to detect.

Prothorax blackish brown. Mesonotal praescutum sepia brown with a trace of a middle black stripe, antero-lateral corners of sclerite lightened with yellow, rest of thorax and powerful coxae sepia brown; wings dark brown, equal in length to halteres, wide at origin, then abruptly constricted and sharply bent, uniformly wide for remainder of length, apex rounded, costal margin and apex bearing numerous stout setae, vein R strong, prominent, contiguous around apex, other venation absent, a white patch in meso-apical region; halteres dusky brown, knobs dirty white; legs dark yellowish brown, tarsi blackened; of the following length:—

	I	II	III
Femur .	5.9	6.2	6.5
Tibia .	6.8	7	7
Tarsus .	7	7.5	7
<hr/>			
Total .	19.7	20.7	20.5

Abdomen swollen, dark blackish brown with yellow pubescence, pleura dirty white, strong ovipositor valves dark reddish brown.

Localities.—Cape Peninsula: Echo Valley (K. H. B., H. G. W.), April 1932 and 1933; Red Gods (C. W. T.), March 1937.

Cape Province: Jonkershoek (K. H. B.), October 1926;
Palmiet River (K. H. B., C. W. T.), May 1937;
Voorkoeden Farm (G. A. W., C. W. T., H. G. W.),
April 1938; Babylons Tower (K. H. B., C. W. T.),
March 1939.

Larva.—Unknown.

Pupa.—Length 14 mm., diameter 2 mm. Colour dark brown, breathing horns a lighter brown, exuviae pale yellowish brown.

Cephalic crest (fig. 39, *c*, *d*) prominent, consisting of a high median truncate lobe, slightly notched (ventral view), a high triangular lobe, tapering but not curved to an acute apex (lateral view).

Thoracic pronotum high; pronotal breathing horns (fig. 39, *b*) long, divergent, directed laterad rather than dorsad, crenulate for one-third of the length, apex not swollen, bluntly rounded. Wing pads in male and female extend to end of abdominal segment 2; leg sheaths in male form a deep **V**, the fore tarsi ending opposite the row of spines on segment 6, hind tarsi opposite the origin of the sternal sheaths on the cauda.

Chaetotaxy nil. Dorsa of abdominal segments 2–7 with a sub-terminal transverse row of acute spines on the posterior annulus in the following notation in male:—17, 22, 18, 12, 10, 10; venter of segments 3–5 bare, segment 6 with seven spines, segment 7 with five spines; in female dorsa of segments 2–7 with the transverse row having the following spines:—22, 22, 20, 18, 13, 13; venter of segment 3 with four spines, two on either side of leg sheaths, five to six on segment 4, twelve on segment 5, eleven on segment 6 and ten on segment 7.

♂ cauda: as in *Longurio dolichoros*, except that there is only one ventral lobe on the anterior region of the cauda and that the dorsal lobe laterad of each spiracle is smaller.

♀ cauda: as in male except for absence of the ventral lobe; tergal and sternal sheaths equal in length, latter fused for greater part of their length, apices divergent, outer angle of each acute, blackened, chitinated.

Remarks.—At Palmiet River Dr. Barnard and Mr. Thorne found three mature pupae just beneath the surface of the soil at the base of a *Restio* clump (May 1, 1937) and five empty “shucks” protruding from the soil. These *Restio* clumps are the typical type of vegetation skirting the open boulder-strewn banks of the river. On May 4, one male and one female imago emerged from the pupae.

Longurio chionoides (Alex.).

Fig. 40.

1917. pp. 164-165, text-fig. 2 (side view); pl. xiii, fig. 44 (nusus) (*Tipula*).

1921. p. 218.

Holotype female subapterous, locality unknown. Additional notes are as follows: length 15-17 mm. Legs have the following lengths:—

	I	II	III
Femur .	3.7-4	5	5.5-6
Tibia .	4.2-5	4.5	6.1-6.5
Tarsus .	4-4.6	4.5	6.3-6.5
<hr/>			
Total .	11.9-13.6	14	17.9-19

Antennae, palpi and wings as in male. The black blotches of the abdomen noted by Alexander are due to eggs in the ovaries; the black closely set impressed punctures are merely the chitinised cuplike pits or alveoli situated at the insertion of the yellowish hairs.

♂: Length 12-14.8 mm. Legs have the following lengths:—

	I	II	III
Femur .	7.5-9.5	9-10	9.5-11.5
Tibia .	8-10	9-10	10-12
Tarsus .	10.2-13.5	12.2-15	17-22
<hr/>			
Total .	25.7-33	30.2-35	36.5-45.5

Colour yellowish brown. Frontal prolongation of head elongate, as long as the lateral diameter of head; nasus slightly bifid, not as deeply cleft as in female, each slight projection bearing stout bristles; palpi (fig. 40, *d*) light brown with ultimate joint pale yellow, one and three-quarters to twice the penultimate joint; eyes black, large; on vertex a prominent median tubercle projects over the origin of antennae, which are 12-jointed (fig. 40, *c*), scapal joint 1 dark reddish brown, elongate-cylindrical, three times its diameter, scapal joint 2 short-globular, flagellum light yellow, joints 1-3 subequal, cylindrical, joints 4-5 shorter and equal, remaining joints equal, short-cylindrical, except the ultimate joint which is bulbous basally, tapering to blunt apex.

Prothorax prominent, dark yellowish brown. Mesonotal praescutum pale yellowish brown, lighter than head or abdomen. Wings (fig. 40, *e*) light yellow, reduced, equal to stem of halter, strongly curved, extending to base of halteres, leaning inwards and touching over the thorax, venation indistinct, slight indication of vein R, costa with numerous short setae. Legs longer and more slender than in female, with coxae enlarged and powerful, fore femora slightly incrassate, but not as noticeably as in female.

Abdomen dark yellowish brown, with black pleural stripe along length of abdomen. Hypopygium of *Longurian* construction, dististyles (fig. 40, *f*) equal in length, outer dististyle a fleshy pubescent lobe, inner dististyle pubescent, broad basally, more or less uniformly wide, tapering abruptly to a curved, chitinised, apical hook, a prominent projecting chitinised ridge near basal region bearing sixteen to eighteen stout dark brown spines.

Localities.—Cape Peninsula: Kirstenbosch (K. H. B., H. G. W.), November 1932; Fernwood (H. G. W.), January 1933; (G. A. W., H. G. W.) October 1933; (K. H. B., H. G. W.) November 1932.

Remarks.—In 1921, p. 218, Alexander contrasted the female of this species with the male of *Longurio micropteryx*, giving a list of differences. The list is valueless—the female *chionoides* closely resembles the female *micropteryx*, both being physogastric and similar in general appearance. The male *chionoides* strongly resembles the male *micropteryx*. It was only after extensive breeding and collecting of the subapterous species of *Longurio* that the correct correlation of males to females was effected.

The subapterous *Longurio* males are easily distinguished *inter se* by the armature and shape of the dististyles; the females, however, present a difficult problem, and the morphologist is compelled to rely on small differences in the size and in the shape of the palpi, antennae and wings. Thus in these descriptions of the subapterous forms great stress has been placed on structural characteristics rather than on varying degrees of colour, which are at best unsatisfactory and transient, depending on the age of the fly, the intensity of the light and the medium in which the specimen has been examined and stored.

Larva.—Length 24–26 mm., diameter 4 mm. Colour dull yellow, integument of abdomen stretched and very thin, revealing the black contents of the alimentary system and the fibres of the muscles. Body plump, terete. Length and distribution of chaetotaxy, general

appearance and the details of the spiracular disc and the head capsule as in *Longurio capicola*.

Pupa.—Length 15–17 mm., diameter 2.3–2.7 mm. Colour of thorax dark reddish brown, abdomen rich orange-yellow, wing pads and legs of mature pupae black, cauda chitinated; exuviae light brown.

Similar to pupa of *Longurio capicola* in shape of mouth parts, breathing horns and bifid cephalic crest (fig. 40, *a, b*). Leg sheaths and cauda of males and females as in *capicola*.

Mesonotum moderately high, having one seta at each wing-root and a transverse mesal row of four larger setae; metathorax with row of six setae. Abdominal segment 1 with row of eight setae, evenly spaced along posterior margin, the two outer setae very elongate, an additional seta at origin of each halter pad; abdominal segments 2–7 subdivided into two annuli, posterior annulus somewhat longer than the anterior and having a subterminal transverse row of stout, acute, caudally directed spines, extending almost to the pleural region in the following notation:—on dorsa 20, 21, 22, 16, 11–12, 5–7; each row interspersed with eight elongate seta, one-half the width of the abdomen, the outer setae situated at end of the two of spines, slightly cephalad of which is an additional seta; venter of segments 5–7 with subterminal row of spines in the order:—16, 15–16, 10, each row having two lateral and two mesal setae; pleura of segments 2–7 with the usual anterior and the posterior spines carrying elongate setae; cephalad of latter group of spines a microscopic spiracle.

In female the number and distribution of spines as follows: dorsa of segments 2–7 with 30–32, 30–32, 23–24, 23, 14–16, 9–10 spines; venter of segments 3–4 bare, of segments 5–7 with 15–16, 18–19, 9–10 spines.

♂ and ♀ cauda as in *capicola*.

Remarks.—Males were caught scurrying over a waterfall at Skeleton Ravine by Dr. Barnard and the author (November 1932). In January 1933 Mrs. Wood and the author discovered the locale of the immatures in Fernwood Ravine. Their type of habitat resembles closely that of the Oudebosch area in which the immatures of *Longurio capicola* were found, the larvae even constructing a similar small cell or compartment at the same depth in the soil. These larvae and pupae are practically identical in their resemblance to the immatures of *Longurio capicola*, for there is no feature whereby the larva of this species can be distinguished from that of *Longurio capicola*, while

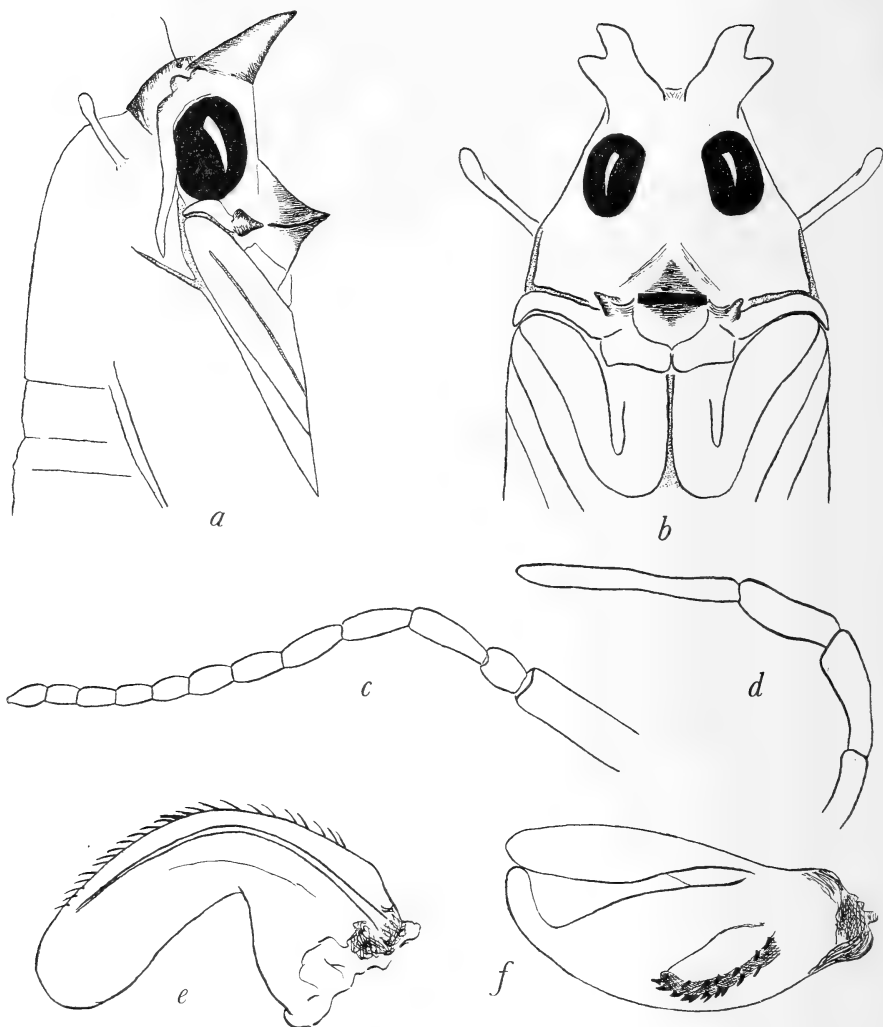


FIG. 40.—Pupa of *Longurio chionoides* (Alex.). Pupa: *a*, head and thorax (lateral view); *b*, ventral view. Imago: *c*, male antenna; *d*, maxillary palpus of male; *e*, wing of male and female; *f*, inner and outer dististyles of male hypopygium.

the pupa is different only in the number of spines in the abdominal armature.

The *chionoides* locality in the beautifully wooded National Botanic Gardens at Kirstenbosch is some eighty miles from the *capicola* locality in the forest remnant of Oudebosch and is separated by the

Cape Flats and the Hottentots-Holland Range of mountains. The sandy soil of the Cape Flats is a formidable barrier to the spread of wingless Tipulidae for the water capacity of the surface soil is low (approximately 12 to 16 per cent.).

There is sufficient evidence, both botanically and entomologically, to show that at some time the forest areas of the S.W. Cape were extensive and stretched from the Cape Peninsula to Knysna and Tsitsikama districts. During that time it is probable that the common ancestral form of these two species spread throughout the entire region. Subsequently, as the intervening sections of forest disappeared, the ancestral forms became isolated in the Oudebosch and the Kirstenbosch localities and evolved into the two markedly different imagoes of to-day, although the larvae and pupae still retain their mutual affinities.

In the Oudebosch locality males retained their wings, whilst the females became hemipterous (wings twice length of halteres) and physogastric. In the Kirstenbosch locality both males and females have become subapterous (wings equal to stem of halteres), the body form of the male being slender, whilst that of the female is physogastric.

The larvae and pupae of both species differ clearly from the immatures of the other species of *Longurio* (see Key).

Longurio micropteryx Alex.

Figs. 41, 42.

1921. pp. 217–218.

Alexander's description of the holotype male is good, but the following details must be noted for the exact differentiation from allied species.

♂: Length 8.5–9 mm., subapterous. Frontal prolongation of head short, stout, half the lateral diameter of head; nasus not bifid but produced into a rounded apex clothed with black hairs; ultimate joint of palpi one and a third to twice the previous joint; eyes black, relatively large; vertical tubercle low, not conspicuous; antennae (fig. 41, *a*) 13-jointed, scapal joint 1 three times as long as broad, cylindrical; scapal joint 2 subglobular; flagellar joint 1 pyriform with narrow base, joints 2–3 slightly swollen; remaining joints equal, elongate-cylindrical; ultimate joint not elongate, slightly dilated apically.

Wings (fig. 41, *d*) curved at origin, then straight, wide, apex truncate, less than one-third the length of a halter. Legs as follows:—

	I	II	III
Femur .	5.5-5	6.2-6.3	6-8
Tibia .	5.5-6	6.3-7	7.4-8.5
Tarsus .	8-9.2	7.8-8.5	15-17.5
<hr/>			
Total .	18.5-20.7	20.3-21.8	28.4-34

Abdominal segments reddish brown with a black pleural stripe along abdomen. Inner dististyle (fig. 41, *c*) pubescent, broad basally, uniformly wide, tapering abruptly to curved, chitinised apical hook, the apical region bearing eight to eleven black spines.

♀: Length 8-11.5 mm. Subapterous, physogastric, the length depending on the number and stage of development of eggs in abdomen. Colour dark brown, noticeably darker than the male, but the structure of antennae, palpi and wings as in male. Legs shorter and stouter than in male, dark yellowish brown.

	I	II	III
Femur .	3	3.1	3.4
Tibia .	2.9	3	3.6
Tarsus .	3	3.1	4.4
<hr/>			
Total .	8.9	9.2	11.4

Abdomen dark chocolate-brown, pleura whitish, dark longitudinal stripe thus absent.

Localities.—Cape Peninsula: Kirstenbosch (K. H. B., H. G. W.), November 1932; (C. W. T.) June 1934; Fernwood (K. H. B., C. W. T., H. G. W.), September 1934; (C. W. T.) June and July 1934; (H. G. W.) November 1933; Isolation Valley (K. H. B.), July 1934; Red Gods (C. W. T.), May 1935; Kasteels Poort (K. H. B., H. G. W.), August 1933; (C. W. T.) May 1934; (C. W. T.) October 1934.

Larva.—Length 15-16 mm., diameter 2 mm. Colour light to dark golden-yellow due to the microscopic pubescence which gives a shiny satiny appearance to the body, integument opaque. Form terete.

Chaetotaxy short on thorax but longer and more definite on abdomen; prothorax with mesal row of four dorsal and four ventral

setae; meso- and metathorax with posterior row of four dorsal, two pleural and four ventral setae. Abdominal segments divided into

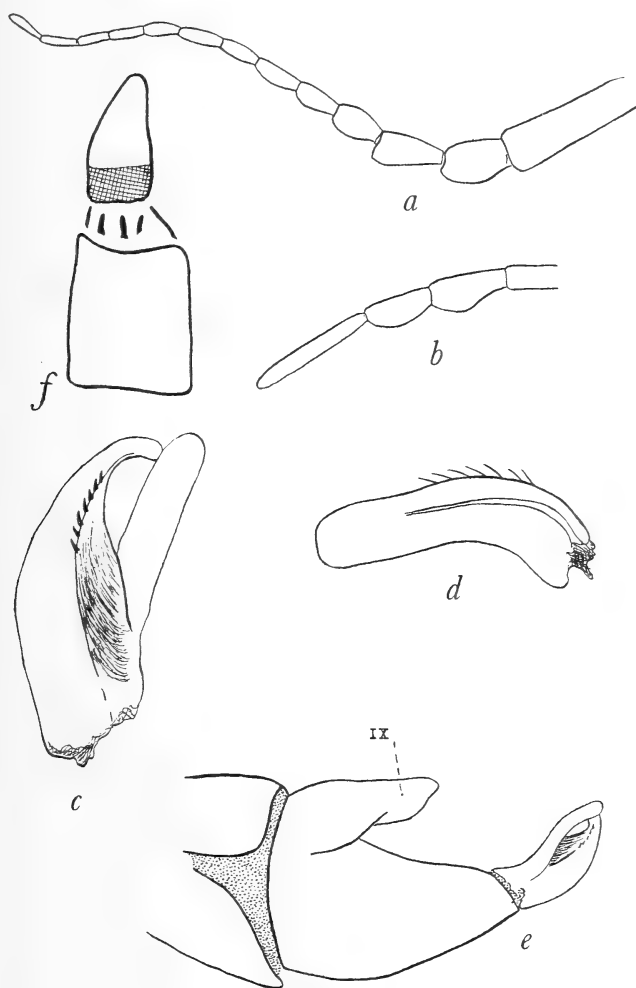
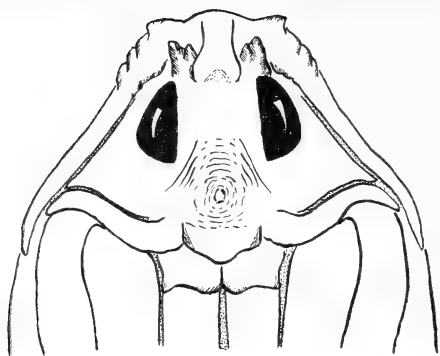
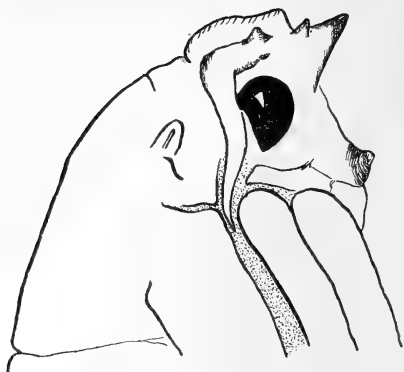


FIG. 41.—*Longurio micropteryx* Alex. Imago: *a*, male antenna; *b*, maxillary palpus of male; *c*, inner and outer dististyles of male hypopygium; *d*, wing of male and female; *e*, male hypopygium (lateral view). Larva: *f*, antenna.

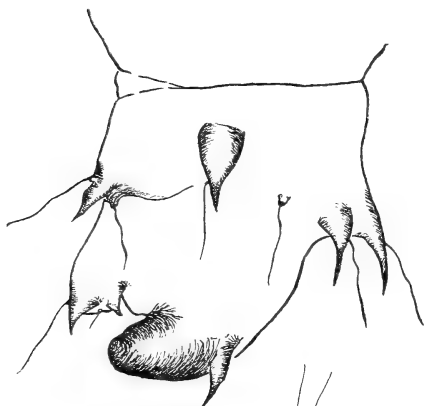
two annuli, posterior annulus twice the length of anterior, former having a transverse row of eight setae, an outer pair closely placed, inner setae slightly caudad, microscopic, a pair of pleural setae and four pairs of ventral setae, each outer seta twice the inner.



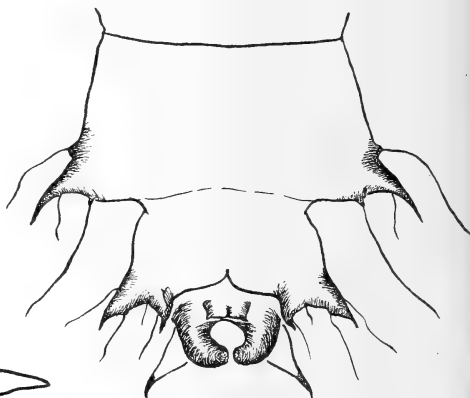
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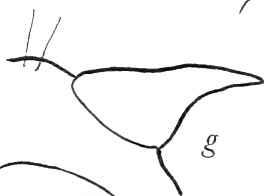
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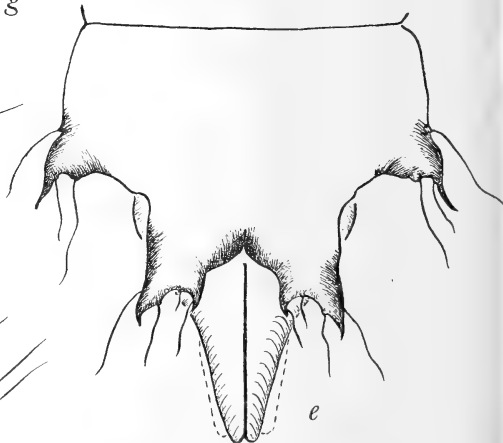
d



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f



e

FIG. 42.—*Longurio micropteryx* Alex. Pupa: a, ventral view of head; b, lateral view; c, lateral view of male cauda; d, dorsal view of male cauda; e, dorsal view of female cauda. Larva: f, spiracular disc; g, spiracular hook, lateral aspect (further enlarged).

End portion of body not constricted, mottled with brown, spiracular disc (fig. 42, *f*) lobeless, heavily chitinised and consequently dark reddish brown, broader than long, spiracles large, circular, black, separated by twice the diameter of a single spiracle; caudad of each spiracle a large stout, black, heavily chitinised curved hook (fig. 42, *g*); laterad of each spiracle three long setae, at hind base of each hook two setae, further laterad and caudad another seta, three lateral setae on edge of body and four ventral setae on ventral surface; anus white, fleshy.

Head capsule of *Longurian* construction. Antennae (fig. 41, *f*) short-cylindrical, as broad as long; auditory organ at mid-length; apical conical papilla large, as long as basal segment; surrounding this papilla are three to four sensory pegs. Mandible with a single broad apical tooth, sometimes with slight indications of a dorsal tooth. Hypopharynx as in *L. minusculus* (fig. 34, *f*).

Pupa.—Length 12–13 mm., diameter 1.6 mm. Colour a rich golden-yellow, older pupae dark brown, with legs, wing pads and thorax almost black, exuviae dark yellowish brown.

Cephalic crest (fig. 42, *a*, *b*) low and inconspicuous, a mere flattened carina between the bases of antennal sheaths, which have at their origin a small conical lobe, ventrad of which are another two conical lobes, the second the larger, prominent, well chitinised, directed ventrad; frons with a chitinised protuberance at mid-length. Antenna (fig. 42, *a*) slightly crenulate along basal margin, slightly sinuous at mid-length, tapering to the slender apex. Labrum broad, anterior margin trilobed, labial palpi broad, uniformly wide, outer angle subacute; maxillary palpi tapering gradually, slightly curved at mid-length.

Thoracic pronotum high, convex. Pronotal breathing horns (fig. 42, *b*) microscopic, rounded apically, as long as the diameter of an antennal sheath at that level, cephalad of breathing horns three short setae; mesothorax high with three to four setae. Wing pads extend to end of abdominal segment 2; leg sheaths in male forming a deep **V**, fore legs the shortest, ending opposite end of abdominal segment 4, hind tarsi opposite subterminal row of spines on abdominal segment 6. Abdominal segments 2–7 subdivided into two annuli, posterior annulus one and a half times the anterior, the former with a subterminal transverse row of acute submamilliform spines, the dorsa of segments 2–5 having eighteen to twenty spines, segment 6 with thirteen to fourteen spines, segment 7 with six spines; venter of segment 3 bare, segments 4–5 with six spines, arranged in two sets

of three, segment 6 with eight spines, segment 7 with eleven spines; pleura of segments 2-7 with the usual three acute spines, each having a long stiff seta.

Chaetotaxy limited, arranged thus: segment 1 of abdomen with three long setae at each postero-lateral angle, remaining segments with three setae at end of each dorsal and ventral subterminal row of spines amid which are two to four additional evenly spaced setae, venter of segments 3-4 with two setae, one on each side of leg sheaths.

♂ cauda (fig. 42, c, d): Tergal and sternal sheaths of usual *Longurian* construction; at base of former sheaths each chitinised lobe is bifid, the outer bifurcation the larger, bearing two long setae, one on the outer margin, one on the inner margin; inner bifurcation with two long setae, one on inner margin, the other towards the base of the dorsal surface, both bifurcations tapering to slender acute blackened spines, between the bifurcations a small seta; anterior region of cauda with two dorso-lateral lobes, a lateral lobe on each side and three to four ventral lobes, each lobe terminating in a large blackened apex, armed with an elongate seta on outer surface, each dorso-lateral lobe having two additional setae on inner surface.

♀ cauda (fig. 42, e): Lobes on anterior region of cauda as in male except for the absence of the ventral lobes; tergal and sternal sheaths of equal length, the former wide at origin, tapering gradually to slender apices, closely placed but not fused along median line; sternal sheaths wide and thicker at origin, fused for the greater part of their length, apex of each sheath a shallow bifurcation, each portion bluntly rounded, ventral lobe on sternal sheaths absent.

Remarks.—This species occurs in two distinct types of environment on Table Mountain: at Kirstenbosch and at Fernwood Ravine on the eastern slopes; at Kasteels Poort and at Isolation Valley on the western side.

The larvae of this species were discovered by Mr. Thorne, accompanied by Dr. Barnard, while they were searching for the immatures of *Tipula coronata* at Kasteels Poort (March 1934). Here the immatures occur in the dry soil at the base of the *Restio* clumps, the larvae being easily distinguished by their rich golden colour. Unlike *Longurio capicola* these larvae do not make a chamber in the soil, but merely burrow at random, seeking the rootlets of the *Restio*. In this locality have been found the immatures of *Longurio flagellata*, *Tipula coronata* and *Nephrotoma antennata*. Adult males are to be

found from late May to early July and again in October, but the majority of pupae occur in April.

In the woods of Fernwood locality the immatures live in the moist soil beneath a carpet of dead leaves, in which also occur the immatures of *Longurio chionoides*, *Goniotipula cuneipennis* and *Tipula caffra*. Adult males occur in June and July or in November, but the majority of pupae are to be found during June, the consequent swarming of the males occurs ten to fourteen days later (June 22 to July 8).

The occurrence of adults in June–July and again in October–November in both of these different localities would indicate that the species is double brooded, but it is more probable that the adults emerging in October–November are stragglers which have taken longer in their larval stadia.

Longurio flagellata sp.n.

Figs. 43, 44.

♂: subapterous; length 5.5–7 mm. Head dark yellowish brown, eyes black, frontal prolongation of head short and small, about the volume of a single eye; palpi dark brown (fig. 43, *b*), small, two-thirds the diameter of an eye, ultimate joint twice the third joint; antennae (fig. 43, *a*) dark brown, two and a half to three times the length of the entire head, 9-jointed, scapal joint 1 cylindrical, twice as long as broad; scapal joint 2 subglobular; flagellar joints 1–3 gradually becoming shorter, the first slightly clavate; joints 2–3 slightly fusiform; joint 4 the shortest of the flagellum; joints 5–6 gradually increasing in length and becoming decidedly fusiform; ultimate joint conspicuously elongate, equal in length to the previous 3 joints—a feature which readily distinguishes this species from the other subapterous members of this genus.

Prothorax prominent, a dark brown ridge. Mesothorax depressed, unicolorous, dark brown, praescutum small, scutellum large, equal in size. Wings (fig. 43, *d*) microscopic, one-third the length of a halter knob, dirty white, with an indication of a single vein. Halteres (fig. 43, *e*) large, stem brown, knob pale yellow. Coxae very powerful, yellowish brown, remainder of legs long and slender, dark yellowish brown, basal third of femora pale yellowish.

	I	II	III
Femur .	5.2-5.8	5.5-6.9	6-6.8
Tibia .	4.5-5.2	5-5.8	6-7.2
Tarsus .	5.5-6.8	9-9.2	10.2-13.6
Total .	15.2-17.8	19.5-21.9	22.2-27.6

Abdomen dark brown, tergites and sternites margined posteriorly with black; hypopygium light yellow, basistyles long, one-third the

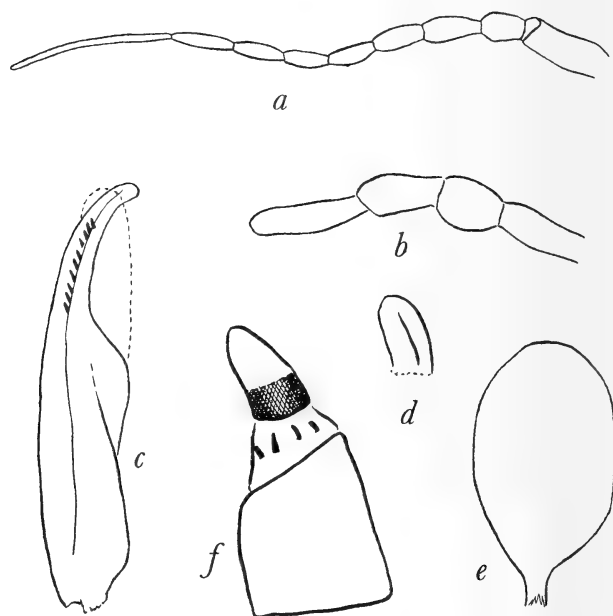


FIG. 43.—*Longurio flagellata* sp.n. Imago: *a*, antenna; *b*, maxillary palpus; *c*, inner dististyle (male hypopygium); *d*, wing; *e*, knob of halter. Larva: *f*, antenna.

length of abdomen, outer dististyle as in genus; inner dististyle (fig. 43, *c*) long and slender without any ridge or protuberance, with ten spines along the length of apical hook.

♀: Subapterous; length 6-7 mm., of which the ovipositor valves are 2 mm. Pale yellowish brown, older ♀♀ darker, often dark reddish brown, ovipositor valves heavily chitinised, elongate, acicular, one-third the length of entire body.

Structure of antennae, thorax and wings as in male, but ultimate joint of antennae not as elongate, only one and a half times the

previous joint; ultimate joint of palpi subequal to previous joint, dilated, not elongate-cylindrical. Legs pale yellowish brown, remarkably short compared with those of the male, femora strongly incrassate.

	I	II	III
Femur .	1.8	2.1	2.9
Tibia .	1.8	2.1	2.9
Tarsus .	1.8	2.5	3
<hr/>			
Total .	5.4	6.7	8.8

Abdomen enormously swollen, out of all proportion even when devoid of eggs, dark reddish brown.

Localities.—Cape Peninsula: Kasteels Poort (K. H. B., H. G. W.), August 1932 and 1933; (K. H. B., C. W. T.) July 1934; Blinkwater (K. H. B., H. G. W.), August 1933.

Cape Province: Witte River (G. A. W., H. G. W.), September and October 1933; Jonkershoek (K. H. B.), July 1927; French Hoek Pass (G. A. W., H. G. W.), September 1935; (K. H. B., C. W. T.) October 1936; Voorkoeden Farm (C. W. T., H. G. W.), May 1938.

Larva.—Length 11–12 mm., diameter 2 mm. Colour of specimens killed in hot water a dirty white, often darkened with brown towards spiracular disc; specimens killed slowly in alcohol dark brown to black, spiracular disc contracted; integument thin, revealing the white fibres of the muscles and contents of the alimentary system after mid abdomen. Form terete.

Chaetotaxy consists of short black setae of uniform length; prothorax with an anterior and a mesal row of six dorsal, three pleural and four ventral setae; meso- and metathorax with similar anterior row of setae. Abdominal segments with a similar posterior row of setae, on dorsa of each outer seta is cephalad of the inner four setae. At abdominal segment 7 the body is slightly constricted, then it expands rapidly, bearing the spiracular disc and the distended white anal gills; spiracular disc (fig. 44, *c*) white, wider than long, the surrounding regions of body irregularly mottled with brown spots and blotches, spiracles of medium size, circular, separated by three and a half times the diameter of one, stigmal ring narrow, dark brown, central area black, chaetotaxy around disc as in *L. capicola*, four small lobes present, the lateral lobes the smallest, fleshy, fingerlike,

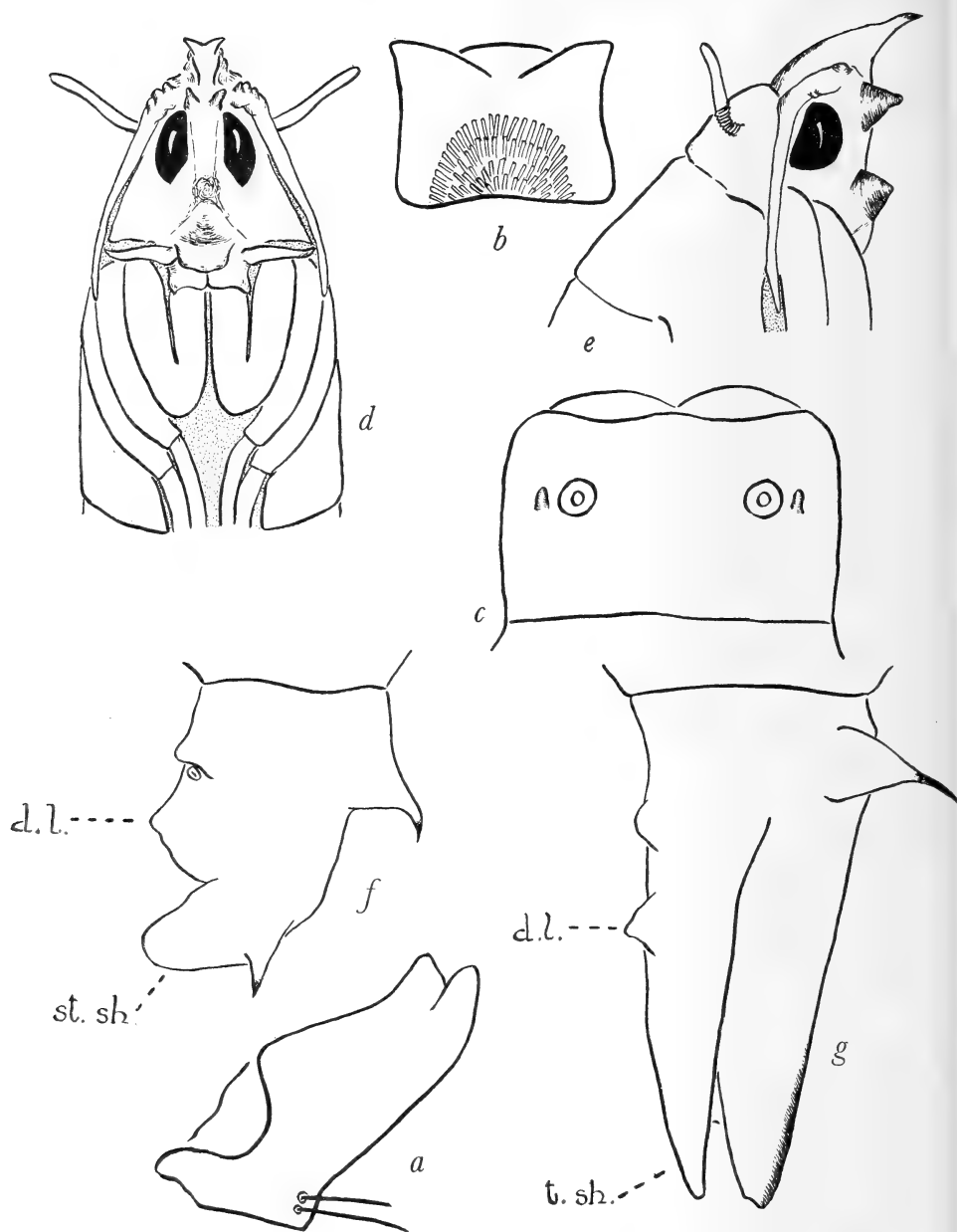


FIG. 44.—*Longurio flagellata* sp.n. Larva: a, mandible; b, hypopharynx; c, spiracular disc (dorsal view). Pupa: d, ventral view; e, lateral view; f, lateral view of male cauda; g, lateral view of female cauda.

bearing an apical and two basal setae, ventral lobes rounded, fleshy protuberances, bearing two apical setae.

Head capsule typically *Longurian*. Antennae (fig. 43, *f*) short-cylindrical, as long as broad, auditory organ at mid-length, apical conical papilla half the length of basal segment, sculptured at base, surrounded by four to five minute sensory pegs. Mandible (fig. 44, *a*) broad at base, produced into bluntly rounded apical teeth, dorsal tooth smallest, ventral tooth large, rounded. Hypopharynx (fig. 44, *b*) with three teeth, the outer teeth large, broad, tapering to acute apices, middle tooth smaller, slightly truncate apically. Mentum with five teeth, middle tooth larger and more acute than the teeth in other species.

Pupa.—Length 8.5–9 mm., diameter 1.5 mm., ovipositor of female 1.8–2 mm. Colour light dirty yellow to dark brown in older pupae, breathing horns black basally, light yellow apically, cauda slightly chitinised.

Cephalic crest (fig. 44, *d*, *e*) very high and prominent, relatively the most conspicuous of the *Longurian* pupae in the S.W. Cape, consisting of a high median protuberance, split into two acute divergent apices (ventral view), a large chitinised lobe curving to an acute, ventrally curved apex (lateral aspect); antennal sheath long, extending beyond base of wing pad by one-quarter the length of pad, tapering gradually to slender apex.

Thoracic pronotum high, elevated, curved. Pronotal breathing horns long, divergent; apices rounded, outer margins not crenulate. Mesothorax high, curved; leg sheaths and wing pads of males and females as in *L. dolichoros*.

Chaetotaxy nil. Abdominal segments 2–7 subdivided into two annuli of equal length, posterior annulus bearing a subterminal row of acute spines arranged on the dorsa of the male thus: 25–27, 25–27, 23–24, 14, 7; venter of segments 3–5 bare; segment 6 with ten spines; segment 7 with twelve spines. In female the dorsa of segments 2–7 have the spines arranged in the following notation: 24, 24, 28, 19, 8; venter of segments 3–5 bare; segment 6 with eight spines; segment 7 with eleven spines.

♂ cauda (fig. 44, *f*): Tergal and sternal sheaths as in other members of genus; the lobes at base of tergal sheaths are small, conical, fleshy, bluntly rounded, not tapering to the usual acute blackened apex; on anterior region of cauda the dorsal lobes laterad of spiracles are reduced or absent, merely indicated in some specimens, ventral lobes two, three or four, usually four, all being acute, on either side of cauda one lateral lobe, acute apically.

♀ cauda (fig. 44, g): Tergal and sternal sheaths of equal length, very long, the former with slender apices, the latter thick and wide at origin, fused for most of length, apices bluntly rounded, lobes on anterior region of cauda as in male, ventral lobes lacking.

Remarks.—Considering its small size and subapterous condition this species is spread over a wide area in the S.W. Cape. Dr. Barnard and Mr. Thorne found the larvae of this species in May 1934 at Kasteels Poort. They occurred in the soil at the base of *Restio* clumps bordering the sides of the swiftly flowing narrow mountain stream. Just beneath the surface of the soil are to be found the pupae from which the male adults emerge after twelve to thirteen days and the female adults after thirteen to seventeen days. The pupae are easily distinguished by their high cephalic crest.

Longurio silvester sp.n.

Figs. 45, a-c; 46.

♂: Length 12-13 mm., wing 13 mm., width 3.5 mm.. Head light yellowish brown; eyes black; frontal prolongation of head short and stout, yellowish brown, nasus present with short black hairs, vertex dark brown, vertical tubercle low, indistinct; palpi dark brown, ultimate joint one and a quarter times the penultimate; antennae (fig. 45, b) 13-jointed, scape light yellow, flagellum dark brown; scapal joint 1 three times as long as broad; scapal joint 2 subglobular; flagellar joints 1-2 subequal, subglobular; joints 3-4 equal in length to joint 2, fusiform; joints 5-10 abruptly narrower than joint 4, consequently remainder of flagellum threadlike; each joint elongate-cylindrical, four to five times as long as broad, ultimate joint small, one-third the penultimate, apex rounded.

Pronotum dark brown. Ground colour of mesonotal praescutum practically obliterated by the three dark brown stripes which are confluent; remainder of thorax, coxae and trochanters dark yellow, almost orange except for a brown stripe extending over the mesepisternum and mesosternum. Wings (fig. 45, a) pale yellowish brown, the suffusion darker along the costal margin as far as the stigma to a depth of vein R. Sc enters R_1 before the fork of RS by a distance equal to r-m; RS six times length of r-m; R_1 and Sc_2 equal, each two and a half times R_{1+2} ; cell R_2 long and narrow, six times its broadest diameter; cell M_1 divergent, twice as wide at wing margin

as tip of cell M_2 ; petiole of M_{1+2} one-quarter the length of its cell, cell 1st M_2 long, two and a half times as long as broad. Legs light brown, tips of femora and tibiae blackened.

	I	II	III
Femur .	7	8	9
Tibia .	7.5	8.2	9.5
Tarsus .	10	14	19
<hr/>			
Total .	24.5	30.2	37.5

Abdomen dark chocolate-brown, first segment often orange; hypopygium yellowish, short; basistyles short and stout; inner dististyle similar in shape to that of *L. minusculus*.

♀: Hemipterous, physogastric; length 10–11 mm., wing 6 mm., width .8–1 mm. Darker than male, head, thorax and legs warm sepia brown; antennae as in male, but frequently they are deformed and are 9-jointed, in which case ultimate joint is formed by the fusion of four normal joints and is irregular in shape (fig. 45, c), flagellar joint 1 elongate-clavate, two and a half times as long as broad, more conspicuous than second subglobular scapal joint; joint 2 abruptly narrowed, slightly fusiform; joints 5–8 threadlike, elongate-cylindrical.

Mesonotal praescutum coloured as in male; wings one-half those of male, long and narrow, four times the length of each pale yellow halter, venation as in male but the dark suffusion and tendency of the wing to wrinkle renders the apical veins and cells indistinct. Coxae of legs large.

	I	II	III
Femur .	4.5	4.4	5.2
Tibia .	4.7	4.2	6
Tarsus .	4.9	5	6.7
<hr/>			
Total .	14.1	13.6	17.9

Abdomen yellowish brown, covered with pubescence of fine yellow hairs, frequently the black small eggs are visible through the integument; ovipositor valves remarkably reduced for the genus *Longurio*, closely resembling those of the species *Tipula caffra* in shape and construction.

Localities.—Cape Peninsula: nil.

Cape Province: Harkerville Forest (G. A. W., C. W. T., H. G. W.), September 1938.

Larva.—Length 15–18 mm., diameter 4·2–4·7 mm. Colour dull dirty yellow, darkened by the brown microscopic pubescence. Form terete, very plump, greatest diameter at segment 4 or 5 of abdomen.

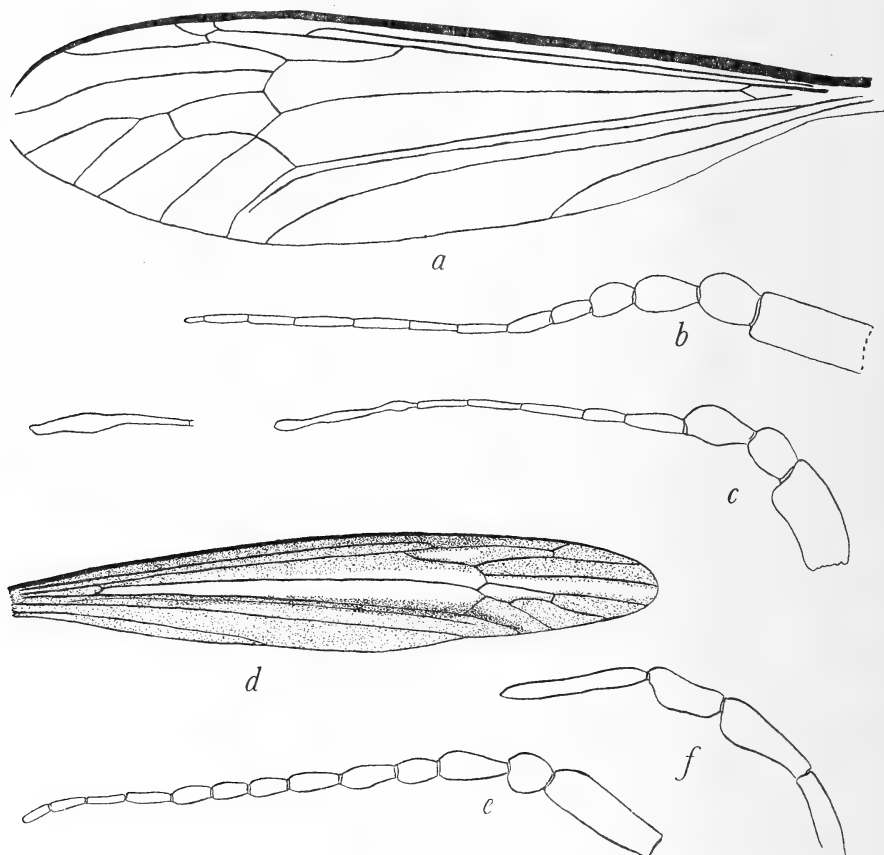


FIG. 45.—*Longurio silvester* sp.n. a, wing; b, male antenna; c, female antenna (with terminal variation). *Longurio minusculoides* sp.n. d, wing; e, antenna; f, maxillary palpus.

Chaetotaxy short, difficult to distinguish against the colour of body to which persistently adhere fine grains of soil; dorsum and venter of prothorax with four setae along anterior margin and one mesal seta towards each side; meso- and metathorax with mesal row of four dorsal, one pleural and four ventral setae; abdominal segments 1–7 subdivided by transverse wrinkles into two unequal annuli, the posterior annulus bearing a row of eight dorsal and six ventral setae; pleura with a large white, rounded protuberance

bearing a central seta twice the height of the swelling; the protuberance on segment 1 smaller than the others.

Spiracular disc white, without chitination, broader than long, anterior margin undulate, overhanging the spiracles but scarcely lobed, bearing a seta which is longer than on the proper lobes, lateral lobes small, conical, fleshy, with minute apical seta, ventral lobes the longest, triangular, fleshy, tapering to subacute apex, bearing an apical seta, inner surface with a circular apical brown mark; integument surrounding disc mottled with pattern of brown spots and blotches; spiracles circular, large, prominent, centre black, outer ring dark brown, separated by the diameter of one spiracle. Anus white, often distended; gills absent; on either side of anus two moderately long setae.

Head capsule compact, massive, typical of genus, closely resembling that of *Longurio minusculus*, differing in the following details: Antenna with basal segment twice as long as broad, cylindrical, apical conical papilla one-third to one-half the basal segment and thus relatively longer. Labrum similarly armed with setiferous punctures and setae within the two circular apical areas, except that the setae are fewer in number, being an elongate outer seta and three to four smaller setae towards inner edge. Hypopharynx a flattened blade, armed with the usual tuft of long acute setae, but each outer angle of plate is rounded and slightly produced into a small blunt tooth; middle tooth definitely missing, its position replaced by a shallow concavity on the plate.

Pupa.—Length 16–18 mm., diameter 2.5–3.1 mm. Colour of male light yellowish on abdomen, thorax deep brownish orange, wing pads black; female entirely dark reddish brown, cauda chitinated.

Cephalic crest (fig. 46, *a*, *b*) prominent, consisting of a moderately high median lobe, slightly notched (ventral view), triangular, tapering but not curved to rounded apex, dorsal margin slightly crenulate (lateral view), the crest being nearest to that of *L. bonae spei* in appearance.

Breathing horns, mouth parts and antennae as in *L. bonae spei*; labral protuberance (fig. 46, *b*) larger and more prominent; leg sheaths and wing pads as in male and female of *L. bonae spei*.

Chaetotaxy nil. Abdominal segments 2–7 in male and female subdivided into two annuli; posterior annulus of segments 2–5 with a dorsal subterminal transverse row of short wide truncate, often acute, spines, eighteen to twenty in number, segment 6 with fourteen to fifteen spines, segment 7 with eight to ten; venter of segments 3–5

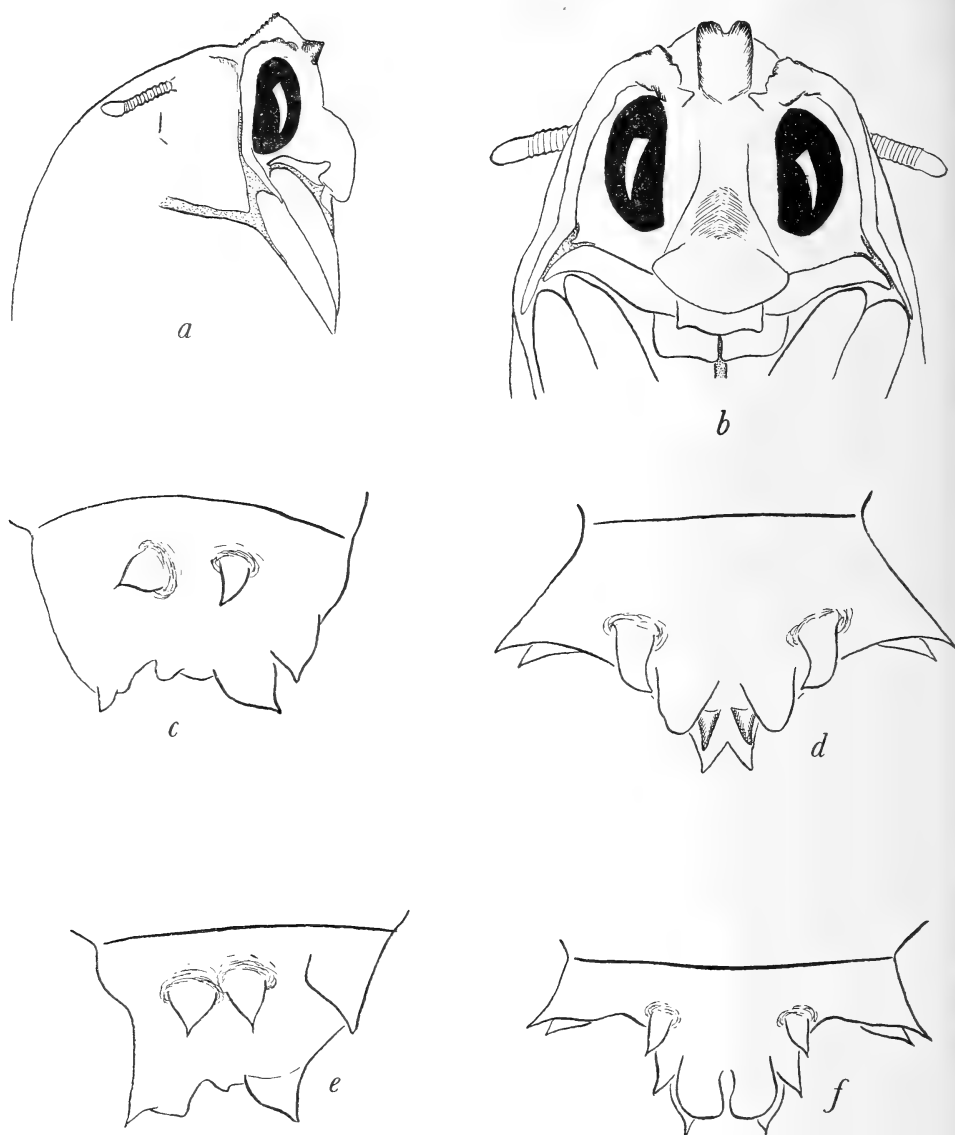


FIG. 46.—Pupa of *Longurio silvester* sp.n. *a*, head and thorax (lateral view); *b*, ventral view; *c*, male cauda (lateral view); *d*, dorsal view; *e*, female cauda (lateral view); *f*, dorsal view.

bare, segment 6 with five to six spines, segment 7 with seven to eight spines; pleura of segments 2-7 having the usual anterior and three posterior spines.

♂ cauda (fig. 46, *c, d*): Tergal sheaths inconspicuous, mere rounded tubercles, at base of each occurs a large lobelike spine; sternal sheaths large, thick, strongly curved dorsally to blunt apices, on ventral surface of each sheath occurs a chitinated spine; anterior region of cauda armed with a dorso-lateral spine laterad of each blackened spiracle and two lobelike spines on each side; ventral spines absent.

♀ cauda (fig. 46, *e, f*): Very wide and short, practically truncate apically; tergal sheaths inconspicuous, merely minute swellings; sternal sheaths much larger but much reduced when contrasted with the more normal sheaths of other species, wide at base, tapering to subacute divergent apices; lobelike spines on anterior region of cauda as in male.

Remarks.—This female pupa is readily distinguished from others of the genus *Longurio* by the abbreviation of the sternal and tergal sheaths on the cauda, which is practically truncate in appearance; in fact this pupa resembles the *coronata* group of the genus *Tipula* more closely than it does other members of the genus *Longurio*. The resultant female imago is easily distinguishable from other *Longurio* females by the remarkably reduced ovipositor valves.

In September 1938 Mrs. Wood discovered the larvae on the outskirts of the dense Harkerville Forest, Knysna district. They occurred around the base of an Ironwood tree in the damp soil rich in humus which is derived from the thick carpet of rotting leaves. From these larvae Mr. Thorne reared two subapterous females and one normally winged male; eight pupae being preserved in alcohol.

Longurio minusculoides sp.n.

Fig. 45, *d-f*.

♂: Length 10-11 mm., wing 8 mm., width 1-1.2 mm. Similar to *L. minusculus* Alex. in coloration and appearance, but differing thus: entire antennae (fig. 45, *e*) dark brown, 13-jointed; flagellar joint 1 slightly clavate; joints 2-4 equal in length, elongate-fusiform; joints 5-7 shorter, two-thirds the length of the previous joint, swollen (but not abruptly narrower as in *minusculus*); remaining joints equal in length, elongate-cylindrical; ultimate joint being rounded apically.

Ultimate joint of palpi equal in length to joints 2 and 3 combined (fig. 45, f).

Wings (fig. 45, d) short, not extending beyond end of abdomen, long and narrow; apical cells consequently elongate and narrow; wings suffused with dark brown except for a narrow white stripe along mid-length, extending from middle of cell R to vein Cu, terminating at m-cu and r-m, but continuing in some specimens along cell R_{4+5} to wing margin, stigma white; venation with Sc_2 absent in two specimens examined, Sc not extending to half-way along RS, consequently R_1 (beyond junction of Sc) long, one and a half times RS; R_{1+2} longer than R_2 , cell 1st R_1 long and narrow, dilated at mid-length; cell M_1 absent; cell 1st M_2 long and narrow.

Abdomen dark brown (not orange as in *minusculus*); outer dististyle as in genus; inner dististyle with small ridge bearing five to six spines (no spines near origin of apical hook).

♀: Length 11–13 mm., subapterous. Entire head, palpi and antennae dark brown, similar in shape to those of male; nasus not bifid but bluntly rounded, clothed with dark brown hairs; eyes black; frontal prolongation of head as long as lateral diameter of head; vertical tubercle low, inconspicuous.

Thorax dark yellow, mesonotal praescutum darkened with brown; wings dark brown, two-thirds the length of the dark brown halteres, wide at origin, then abruptly narrowed and swelling slightly to rounded apices, vein R prominent, bearing about twenty stout setae, costal margin with thirty to forty setae. Legs dark brown, long and slender for a subapterous female of this size; as follows:—

	I	II	III
Femur .	4.5	5	6
Tibia .	4.5	5	6.4
Tarsus .	5	5.8	7
<hr/>			
Total .	14	15.8	19.4

Abdomen swollen, reddish brown, with yellowish pubescence, the multitudinous black eggs clearly visible through the integument, giving a mottled effect to the abdomen; ovipositor valves a dark chestnut brown.

Localities.—Cape Peninsula: nil.

Cape Province: Vreyersberg (K. H. B., C. W. T.),
October 1937.

Larva.—Unknown.

Pupa.—Length ♂ 11–15 mm., ♀ 15–16 mm.; diameter ♂ 1.5–1.6 mm., ♀ 1.9 mm.

Colour pale yellowish brown, breathing horns black, cauda heavily chitinised.

Cephalic crest, mouth parts, antennal sheaths, thorax and pronotal breathing horns as in *L. dolichoros*; the wing pads, however, reveal the typical venation of the male.

Abdominal segments subdivided as in *L. dolichoros* but the number of spines and their distribution, especially in the male, afford a striking difference. Segment 1 with a transverse row of six dorsal spines; dorsa of segments 2–5 with twenty-eight to thirty acute spines in a subterminal transverse row across the posterior annulus; segment 6 with eighteen spines; segment 7 with fourteen; venter of segments 3–5 not bare in male, segment 3 having two spines at mid-length on either side of leg sheaths, segment 4 with six spines arranged in three pairs across the posterior annulus, segment 5 with nine spines arranged in three sets of three; in the above two segments the spines are beneath the tarsal sheaths, segment 6 with fourteen spines, segment 7 with nine to eleven spines.

In female the dorsa of segments 2–5 have thirty to thirty-two acute spines in the subterminal row, segment 6 with nineteen spines, segment 7 with fourteen; venter of segment 3 with nine spines arranged in three sets of three, segment 4 with six spines in three pairs, segment 5 with fifteen spines, segment 6 with thirteen, segment 7 with eleven.

Chaetotaxy nil.

♂ cauda as in *L. dolichoros*; ♀ cauda as in male except for absence of ventral lobes in anterior region; sternal sheaths with the apices acute and divergent.

Remarks.—In October 1937 Dr. Barnard and Mr. Thorne collected on the slopes (2000 feet) of Vreyersberg between Herbertsdale and Van Wyksdorp winged adult males of this species. Numerous subapterous male *Longurio dolichoros* were also found by sweeping the clumps of *Restio*. Several larvae, pupae and empty “shucks” were found amid the roots of the *Restio* clumps. From these pupae were reared eight winged males and six subapterous females of *L. minusculoides* and also fifteen subapterous males of *L. dolichoros*, the pupae of these two species being accurately correlated. The correlation of the winged males with the subapterous females bred is indubitably correct, for these differ remarkably from those of *L. dolichoros* in the length of the wings (see Key).

The five perfect larvae are uncorrelated and are assigned to *L. dolichoros* due to the close similarity in every detail to the larvae of *L. dolichoros* found at Tradouw Pass, Langebergen. In spite of exhaustive examination, the author has been unable to find the slightest detail whereby these Vreyersberg larvae of *L. dolichoros* could be distinguished from the Tradouw Pass specimens of the same species. Although both the localities mentioned above are on the Langebergen Range, they are fifty-five to sixty miles apart and are separated by the formidable Gouritz River Gorge, the formation of which occurred at an early stage in the evolution of the present-day topography (Barnard, 1936).

Longurio dolichoros sp.n.

Fig. 47.

♂: Subapterous; length 8.5–11 mm. Head light orange-yellow, blackened along the low inconspicuous vertical tubercle; eyes black; nasus with a shallow bifurcation, clothed with fine hairs; frontal prolongation of head as long as lateral diameter of head; palpi and antennae dark brown, the second and third joints of the former equal (fig. 47, *b*), ultimate joint one and a quarter times the previous joint; antennae (fig. 47, *a*) 10-jointed, scapal joint 1 cylindrical, three times as long as broad; scapal joint 2 subglobular; flagellar joint 1 clearly clavate; joints 2–4 equal in length, fusiform, gradually becoming more narrow; joints 5–7 suddenly shortened, similar in width to previous joint; ultimate joint one and a half the penultimate, rounded apically.

Entire thorax, coxae and trochanters a rich orange-yellow; prothorax ridged, mesothorax depressed, praescutum small, margined with a black border which is continued round the postnotum. Wings (fig. 47, *d*) dark brown, about the length of a halter knob, wide at origin, bluntly rounded apically, with indications of two veins, R and M; halteres long, stem and knob dirty white; coxae powerful; legs long and slender, dark yellowish brown, of following length:—

	I	II	III
Femur .	7.5–8	8–8.5	8.2–10
Tibia .	7.5–8	8–8.5	10.5–11
Tarsus .	10–13	12–14.5	14–16.5
Total .	25–29	28–31.5	32.7–37.5

Abdominal segments 1 and 2 orange-yellow, remainder darkened with brown on tergites, sternites pale orange-brown; hypopygium yellow; outer dististyle as in genus; inner dististyle (fig. 47, c) with a short yet prominent protuberance at mid-length bearing six stout spines.

♀: Subapterous; length 11.5–12 mm. Similar to male in shape of palpi, antennae and wings. General coloration dark brown, with a silver bloom over entire physogastric body. Legs slender and relatively long for a subapterous female of this length; fore femora scarcely incrassate.

	I	II	III
Femur .	4.5	4.5	5
Tibia .	4	4	6
Tarsus .	5	5	5.5
<hr/>			
Total .	13.5	13.5	16.5

Abdomen dark reddish brown as in other females of this genus.

Localities.—Cape Peninsula: nil.

Cape Province: Langebergen (Swellendam area) (K. H. B.), October 1925; (K. H. B., A. J. H., C. W. T., H. G. W.) January 1935; Vreyersberg (K. H. B., C. W. T.), October 1937; Coloniebos, Swellendam (G. A. W., C. W. T., H. G. W.), September 1938.

Larva.—Length 15–16 mm., diameter 3 mm. Similar in colour and general appearance to larvae of *L. spinosa* and *L. flagellata*.

Chaetotaxy very short, the setae being mere sharpened points; spiracular disc (fig. 47, e) with lateral lobes joined anteriorly by a low ridge, spiracles circular, often indistinctly tricoloured, separated by twice the diameter of one spiracle.

Head capsule has the antennae one and a quarter times as long as broad, short-cylindrical, apical conical papilla one-half the length of basal joint, surrounded by five to six sensory pegs. Mandible similar to that of *L. flagellata*, with three teeth, ventral tooth almost truncate. Hypopharynx (fig. 47, f) with three teeth; outer teeth large, rounded on inner edge, outer angle truncate; middle tooth broad, bluntly rounded.

Pupa.—Length 14 mm., diameter 1.5 mm. Colour light orange-yellow; breathing horns black with dark reddish-brown apices; older pupae almost entirely dark sepia-brown; exuviae pale yellowish brown.

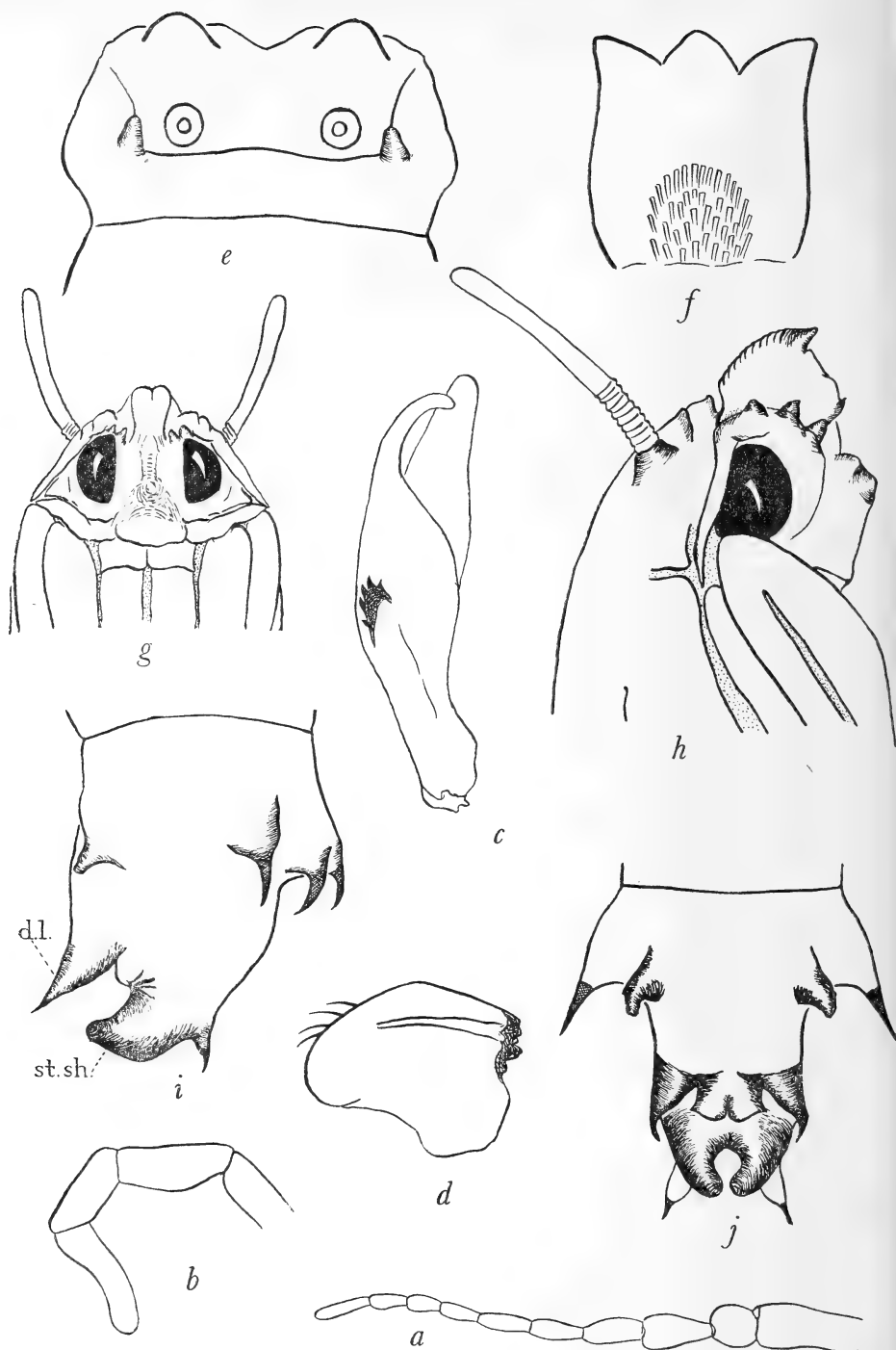


FIG. 47.—*Longurio dolichoros* sp.n. Imago: *a*, antenna; *b*, maxillary palpus; *c*, inner dististyle (male hypopygium); *d*, wing. Larva: *e*, end of abdomen; *f*, hypopharynx. Pupa: *g*, ventral view; *h*, lateral view; *i*, lateral view of male cauda; *j*, dorsal view of male cauda.

Cephalic crest (fig. 47, *g*, *h*) large, prominent, consisting of a high median truncate lobe (ventral view), arising with a strong curve dorsad of the origin of antennal sheaths, curving ventrad to an acute apex (lateral view), continued to the origin of antennal sheaths. Frons bears ventrally a small cone. Labrum (fig. 47, *g*) broad, anterior margin undulate, outer angles bluntly rounded and somewhat swollen, mid-region tapering to a shallow apex; labial lobes uniformly wide, apices tapering sharply; maxillary lobes long, not recurved, wide at origin, then constricted and tapering to slender acute apices. Antennal sheaths (fig. 47, *g*, *h*) have three conspicuous chitinised conical lobes at origin, the third the smallest, the first two directed ventrad, remainder of sheath slender, tapering to rounded apex, extending to base of wing pad.

Thoracic pronotum high, curved. Pronotal breathing horns (fig. 47, *g*, *h*) long, conspicuous, divergent, much blackened and crenulate basally, cylindrical, apex slightly swollen, reddish brown, bluntly rounded. Mesothorax high, curved. Wing pads in male and female extend to the posterior margin of abdominal segment 2; leg sheaths in male forming a deep **V**, fore tarsi the shortest, ending opposite posterior margin of abdominal segment 4; hind tarsi opposite anterior annulus of abdominal segment 6; in female, tarsi form a shallow **V**, fore tarsi ending opposite posterior margin of abdominal segment 3, hind tarsi opposite anterior annulus of abdominal segment 4.

Chaetotaxy nil.

Segment 1 of abdomen with a transverse mesal row of six short spines across the dorsum; segments 2-7 subdivided into two annuli, posterior annulus one and a half times the length of the anterior, the former annulus with a subterminal transverse row of long sharp spines, seventeen on dorsa of segments 2-5, ten on segment 6, four to six on segment 7; venter of segments 3-5 bare, venter of segment 6 with subterminal transverse row of five to six spines, segment 7 with seven to eight spines, the bases of which are large fleshy protuberances; pleura of segments with a single spine at mid-length of the anterior annulus, the posterior annulus at mid-length having a large acute spine on a fleshy protuberance at the base of which is a smaller spine.

In the female the number and distribution of spines is as follows: dorsa of abdominal segments 2-5 with twenty-two spines; segment 6 with fourteen spines; segment 7 seven to nine spines; venter of segments 4-5 not bare but with seven spines of which two are near each lateral margin and three small mesal spines; venter of segment 6 with eleven spines; segment 7 nine spines.

♂ cauda (fig. 47, *i, j*): Tergal sheaths inconspicuous, not apparent at first, mere truncate indications of lobes, at the base of each occurs a large chitinised lobelike spine, tapering to acute blackened apex; sternal sheaths large, thick, fingerlike, strongly curved dorsally to blunt apices, on ventral surface of each sternal sheath occurs a chitinised spine armed with a short apical seta; anterior region of cauda having a chitinised dorso-lateral lobelike spine and seta, the inner surface with a blackened spiracle; on the lateral regions of cauda an acute lobelike spine; ventral region of cauda with two similar spines closely placed on the median line.

♀ cauda with similar lobelike spines on anterior region except for the two ventral ones are absent; tergal sheaths elongate, wide at origin, tapering gradually to slender apices, closely placed but not fused along median line; sternal sheaths wide at origin, thicker and longer than tergal sheaths.

Remarks.—In January 1935 Dr. Barnard, Dr. Hesse, Mr. Thorne and the author collected many larvae of this species in the clumps of *Restio* which sheltered a small stream. Several pupae and adults were reared from this material.

In the pendulous filaments of moss in this streamlet were found the larvae and pupae of *Limonia rubrithorax* (see later life-history).

Longurio spinosa sp.n.

♂: Length 8-9.5 mm.; subapterous. Frontal prolongation of head stout and short, dull yellow, entire occiput densely haired, dark brown, almost black except for a thin yellow band behind eyes, this suffusion prolonged on to the low vertical tubercle; nasus indistinctly bifid, with numerous hairs; palpi with coarse bristles, dull brownish yellow, fourth joint as long as joints 2 and 3 combined; antennae 11-jointed, twice as long as palpi, scape brownish yellow, flagellar joints darker brown; scapal joint 1 elongate-cylindrical, three to three and a half times as long as broad; scapal joint 2 globular, as long as broad; flagellar joint 1 elongate-clavate, one and a half times as long as broadest diameter; joints 2-3 subequal to joint 1, short-fusiform, one and a half times as long as broad; joints 4-6 slightly shorter in length but considerably wider, becoming short-oval; joint 7 short-oval but less wide than previous joints; joints 8-9 equal to one another, one-half length of joint 7, short-cylindrical; ultimate joint rounded apically.

Thorax not elevated, mesonotal praescutum brownish yellow with

four dark brown stripes, the intermediate pair separated by a pale vitta, both extending from the anterior to posterior margins of sclerite, lateral stripes curved, broad, not extending to anterior margin; often the praescutum yellowish suffused with brown and stripes not distinct. Wings short, pale yellow, one-half the length of a halter. Halteres whitish yellow, stem long and slender. Coxae, trochanters and femora light yellow, the latter darkened near apices; tibiae and tarsi brownish; legs of the following lengths:—

	I	II	III
Femur .	5	5.5	6
Tibia .	5	6	6.5-7
Tarsus .	7	9	14-15
<hr/>			
Total .	17	20.5	26.5-28

Abdomen with dense golden pubescence, tergites 2-8 darker brown, posterior margins blackened, sternites 2-7 yellow, eighth segment brown; hypopygium yellow.

Female unknown, probably subapterous judging from the female pupae available for study.

Localities.—Cape Peninsula: nil.

Cape Province: Meirings Poort Spitzkop (K. H. B., C. W. T., H. G. W.), February 1932; (C. W. T., and L. D. Boonstra) January 1935.

Larva.—Length 15-16 mm., diameter 3 mm. Colour dirty white but most specimens are blackened from the thorax, due to the dark alimentary contents showing through the extremely thin integument, the fibres of the muscles and the ganglia of the ventral nervous system even being clearly visible. Form terete, plump.

Chaetotaxy definite, long; prothorax with an anterior and a mesal row of six dorsal, three pleural and four ventral setae; meso- and metathorax with a mesal row of eight dorsal, three pleural and eight ventral setae, the two inner setae being near the anterior margin; abdominal segments with posterior row of eight dorsal setae, outer pair close to and near middle of dorsum, inner setae along posterior margin, two to three pleural setae and four pairs of ventral setae near posterior margin.

Body not constricted at end, anal gills blown to form a large whitish bulb, spiracular disc not chitinated, broader than long, with four small fingerlike lobes, the lateral lobes the smaller, fleshy, white, with an apical seta, at base another seta, further cephalad an additional seta; ventral lobes broad, with a small yellowish crescent

on inner face and two apical setae; spiracles small, circular, separated by three times the diameter of one, mostly tricoloured, outer ring dark reddish brown, middle ring yellow, central area black; three lateral setae near edge of body and four ventral setae.

Head capsule of *Longurian* type. Antennae one and three-quarters as long as broad, cylindrical, apical conical papilla one-third the length of basal segment, surrounded by three sensory pegs. Mandible with an apical tooth and a strong ventral tooth. Hypopharynx with five teeth along anterior margin, middle tooth the largest, rounded; outer teeth bluntly rounded; inner teeth often worn and irregular in shape, usually a truncate ridge.

Pupa.—Length 14–15 mm., diameter 1.8–2 mm. Colour light orange-yellow, breathing horns deep yellow to dark brown, cauda chitinated.

Prothorax as in *dolichoros*; pronotal breathing horns one-half the length of those of *dolichoros*, similar in shape, divergent.

Chaetotaxy short, confined to pleural spines. Abdominal segments 2–7 subdivided into two annuli, the posterior annulus twice the length of the anterior, the former annuli having the transverse row of spines in the following notation: 29–36, 31–39, 34–37, 24–28, 14–18, 10–12; venter of segments 5–7 with the subterminal row of spines in the order 14–18, 12–15, 11–13.

In female the dorsum of segments 2–7 with the spines thus: 34–36, 39, 31, 23, 16, 8–11; venter of segments 3–4 with twelve spines, on former segment one or six on either side of leg sheaths, segments 5–7 with 11–20, 17–20, 7–9 spines.

♂ cauda as in *dolichoros*; ventral lobes on anterior region of cauda two to four.

♀ cauda as in male, except for absence of ventral lobes; tergal sheaths slightly longer than sternal sheaths, which are bluntly rounded apically.

Remarks.—In February 1932 larvae were discovered near the summit (5000 feet) of Meirings Poort Spitzkop by Mr. Thorne. They occurred amid the rhizoids of a thick carpet of moss growing in the shelter of a rocky pinnacle.

Genus GONIOTIPULA Alex.

1921. p. 213.

Imago.—Rostrum short, not exceeding rest of head; antennae of male elongated, 12-jointed, without verticils; in female antennae

shorter, less than one-half those of male; wings with anal angle lacking, RS elongate, exceeding m-cu; Sc₁ lacking, Sc joins R far beyond origin of RS, usually opposite three-quarters the length of RS, tip of Sc₂ and of R₂ atrophied; cell M₁ petiolate; 1st M₂ present; "anal furrow" evident, almost attaining wing margin, vein 2A straight, rather long, almost parallel to anal angle of wing. Male hypopygium with ninth tergite notched, ninth sternite extensive; a single dististyle articulates with each basistyle; female ovipositor reduced, valves fleshy, not acicular.

Larva.—Form plump, terete. Chaetotaxy composed of stiff setae. Spiracular disc surrounded by six lobes. Head capsule retractile, compact; antennae two to two and a half times as long as broad, elongate-cylindrical, apical papilla small, one-third of the basal segment, surrounded by three to four sensory pegs; mandible as in genus *Tipula*; maxilla of *Limonian* construction; labrum having two circular areas bearing few setae; hypopharynx with three wide anterior teeth; prementum a fleshy scurfy rounded lobe; mentum with seven teeth. Anal gills absent; anus distended, white.

Pupa.—Form slender, stout. Cephalic crest inconspicuous, a chitinised triangular lobe, apex slightly bifid. Maxillary palpi strongly curved but not recurved at tips. Pronotal breathing horns short-cylindrical, directed outwards and caudad. Wing pads extend to end of abdominal segment 2; legs in female to end of segment 4, in male to opposite anterior annulus of segment 6. Chaetotaxy greatly elongated, conspicuous. Armature of abdominal segments strong, each dorsum with a transverse row of twenty to twenty-eight acute spines, venter 6-7 with ten to twelve spines, interspersed with about eight setae. Cauda truncate; tergal sheaths absent; sternal sheaths large; segment eight of cauda with a semicircle of two dorsal and two lateral lobes round the two large conspicuous spiracles.

This genus is represented in the S.W. Cape by a single species, the immatures of which frequent the rich soil of shady woods.

Goniotipula cuneipennis Alex.

Figs. 48, 49.

1921. pp. 213-214.

♂: Length 8-8.6 mm., wing 8-8.5 mm., greatest width 1.5-1.6 mm., antennae 3 mm. General coloration light brown. Antennae (fig. 48, *b*) 12-jointed, not "11-segmented" as stated by Alexander, elongate, as

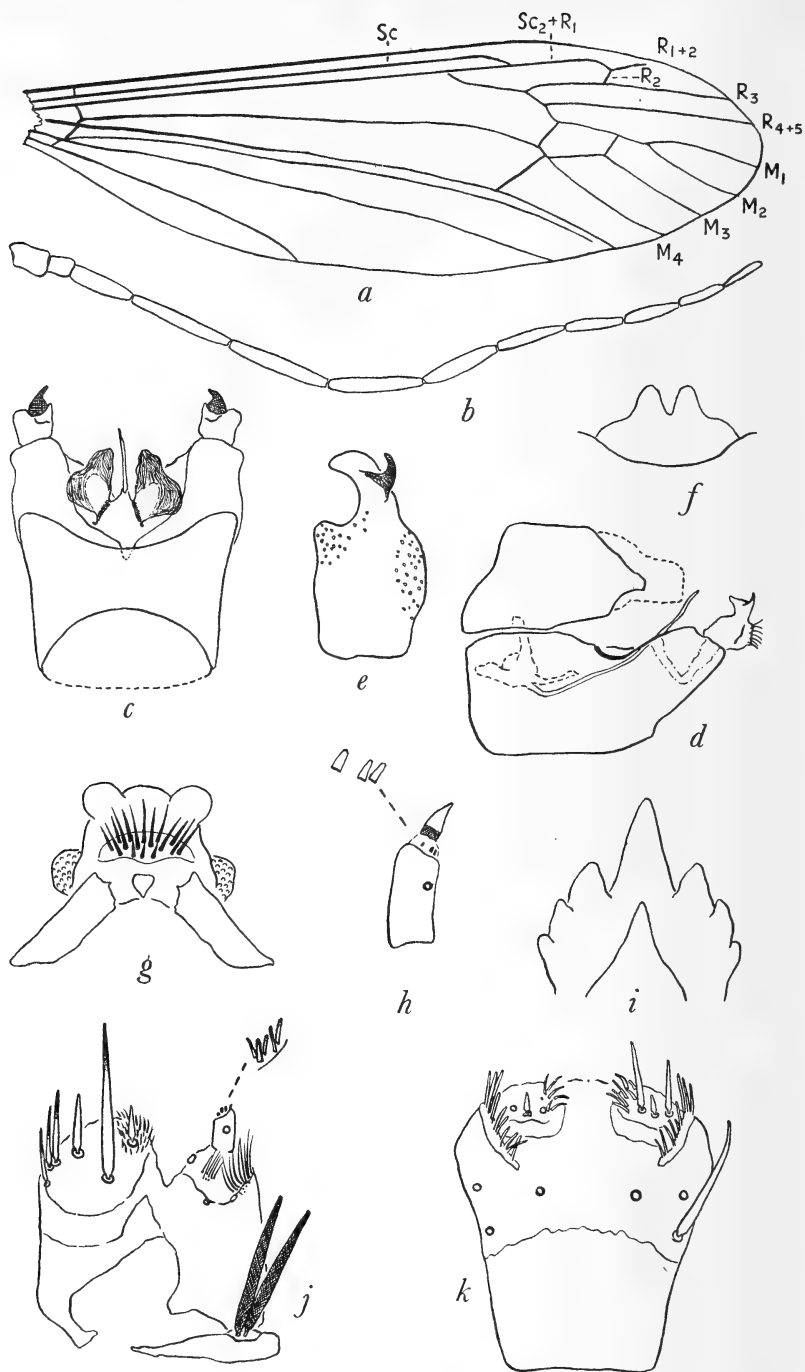


FIG. 48.—*Goniotipula cuneipennis* Alex. Imago: *a*, wing; *b*, male antenna; *c*, hypopygium (dorsal view); *d*, lateral view; *e*, dististyle; *f*, membranous tissue on ninth tergite. Larva: *g*, hypopharynx and prementum; *h*, antenna; *i*, mentum; *j*, maxilla; *k*, labrum (dorsal view).

long as head and thorax combined—if bent backwards, extending to base of abdomen; scapal joint 1 short-cylindrical, one and a half times as long as broad; scapal joint 2 abruptly narrower and shorter, one-half the length of joint 1, slightly longer than broad; flagellar joints elongate-cylindrical, joint 1 four times as long as broad, joints 2–3 becoming considerably longer, being seven times as long as broad; remaining joints gradually becoming shorter, five times as long as broad; ultimate joint rounded apically.

Wings (fig. 48, *a*) as described by Alexander.

Male hypopygium (fig. 48, *c, d*): ninth tergite broad, caudal margin concave, densely clothed with stiff setae or coarse hairs, attached to ventral surface a large membrane, which is prolonged caudad into two rounded lobes concealing the aedeagus (fig. 48, *f*). Basistyles longer than broad, wide basally, tapering slightly to blunt apices, bearing a single dististyle (fig. 48, *e*), which is a flattened fleshy structure, pubescent on the outer surface and divided apically into two chitinised hooks, the dorsal hook smaller and more acute than the ventral, inner apical angle slightly produced, bluntly rounded, bearing twenty to thirty stiff setae. To the inner mesal surface of the basistyles is attached the chitinised flattened lateral prolongations of the aedeagal sheath, which itself is minute and inconspicuous. Penis bulbous basally, situated at the junction of the eighth and ninth sclerites, consisting of a slender elongate tube curved slightly ventrad and projecting from the minute aedeagal sheath. The basal portion of the penis is orientated through 90° , so that the “latera” project cephalad and caudad; whilst the “basum” is directed dorsad, being a wide flattened plate.

Female antennae of similar shape and number of joints to male, but shorter in length, being less than one-half those of male—if bent backwards, extending almost to mid-length of mesonotal praescutum. Ovipositor valves reduced, fleshy, not acicular; of equal length, as long as broad.

Larva.—Length 9–10 mm., diameter 3 mm. Colour dull dirty fawn; abdominal segments darkened by the short dense blackish-brown pubescence; thoracic segments pale yellow with short narrow strips of pubescence.

Form terete, plump, greatest diameter at fourth abdominal segment. Abdominal segments 5–6 with a fleshy conical protruding lobe on each lateral surface, larger on latter segment.

Chaetotaxy composed of short stiff setae, distributed as follows: prothorax with six dorsal, two lateral and four to six ventral setae

along anterior margin; meso- and metathorax with transverse row of four dorsal, two lateral and four ventral setae. Abdominal segments with similar distribution, but this is difficult to detect against the dark body background.

Spiracular disc surrounded by six lobes, two dorsal, two dorso-lateral and two ventral, the latter the largest, broad, dull cream, inner surface mottled with brownish-yellow triangle and bearing a short apical seta, outer basal angle with a stiff seta; the first four lobes narrow, almost as long as ventral lobes, fingerlike, tapering slightly to bluntly rounded apices, inner and outer surfaces coloured dark brown. Spiracles small, one-half width of the triangular mark on ventral lobe, separated by twice the diameter of a single spiracle, central area blackish brown, outer ring pale yellowish brown. Anal gills absent; anus blown, white in colour. Laterad of anus a short seta, ventrad a transverse row of four setae.

Head capsule retractile, compact, massive, heavily chitinated, pre-frontal sclerite large, conspicuous. Basal segment of antenna (fig. 48, *h*) elongate-cylindrical, two and a half times as long as broad, auditory organ on inner mesal surface, apical papilla large, conical, one-third the length of basal segment, sculptured basally, surrounded by three to four minute papillae. Mandible heavily chitinated, large, powerful, produced into a blunt apical tooth and a single rounded ventral cutting tooth. Labrum (fig. 48, *k*) large, broad, conspicuous, with row of four punctures across meso-lateral surface and an additional puncture caudad of outer puncture, each puncture bearing an elongate slender tapering seta; apical surface with two large circular areas having four inner setae, the outer pair short, lateral margin of circle chitinated, bearing numerous short acute setae, three to five at apex, nine continued dorsad along edge of chitinous strip. Maxilla (fig. 48, *j*) large, broad; cardo moderately long, tapering, with two long setae; outer lobe chitinated basally, with a moderately elongate palpus at apex, armed with nine to ten minute sensory papillae, surrounded basally by fringe of short, curved, setalike hairs; inner lobe with three to four short setae on inner margin, two mesal setae, the dorsal seta much elongated, powerful, and an outer seta, inconspicuous, surrounded by dense pubescence of minute stiff hairs. Hypopharynx (fig. 48, *g*) a wide narrow plate with three teeth and beset with microscopic acute hairs. Prementum a fleshy lobe attached to hypopharynx, rounded apically and covered with finely pointed scurfiness. Mentum (fig. 48, *i*) deeply split behind but not completely divided, with seven teeth on

anterior margin, increasing in size from each outer tooth to the powerful acute median tooth.

Pupa.—Length: male 7.5–7.8 mm., female 8.5–9.2 mm.; diameter: male 1.5–1.6 mm., female 1.8–2 mm. Coloration sulphur yellow, wing pads darker, armature of cauda dark brown, mature pupae similarly coloured but head and thorax are dark brown; eyes black; wing pads and legs dark blackish brown.

Form short, plump; head of moderate size. Cephalic crest small, inconspicuous, consisting of chitinised triangular lobe directed ventrad (lateral view), apex somewhat bifid (ventral view). Antennal sheath slender, joints clearly visible; in female ending at same level as apex of labrum; in male elongate, extending to one-half the wing pad. At base of antennal sheaths a row of three minute, rounded tubercles. Labrum bluntly pointed; labial lobes short; maxillary palpi strongly curved but not recurved at tips (fig. 49, *b*).

Pronotal breathing horns (fig. 49, *a*) short, scarcely as long as maxillary palpi, slender, cylindrical, rounded apically, directed outwards and caudad. Pronotum high, slightly ridged, bearing three setae midway between antennal sheath and base of breathing horn. Wing pads extending to end of abdominal segment 2; leg sheaths in female opposite end of segment 4, in male at end of anterior annulus of segment 6; mid tarsi slightly shorter than the others.

Abdominal segments 2–7 subdivided into two equal annuli: dorsa of segments 2–7 with subterminal transverse row of twenty to twenty-eight acute spines, venter of segments 6–7 with ten to twelve spines. Chaetotaxy composed of greatly elongated coarse setae, distributed thus: mesothorax twelve setae—a pair at insertion of each wing pad, slightly caudad but dorsad a triangle of three setae; just posterior to V-shaped suture of imago another seta on either side of median line; metathorax two dorso-median setae, laterad of which a group of three setae. Abdominal segment 1 with transverse row of eight setae, cephalad of each outer seta an additional seta. Dorsum of abdominal segments 2–7 with eight scattered setae, occurring usually amid the subterminal row of spines, cephalad of each outer seta an additional seta; anterior annulus of pleura with a solitary mesal seta; posterior annulus with group of three setae; posterior annulus on venter of abdominal segments 3–4 with three setae, one of which is cephalad of each outer seta, all situated on either side of leg sheaths; of segments 5–7 with setae forming transverse subterminal row.

♂ cauda (fig. 49, *c, d*): Somewhat truncate, tergal sheaths absent, sternal sheaths large, bulbous, outer angle tapering suddenly to acute

chitinated tips; on dorsal base of each sheath a prominent, tapering, dark brown chitinated lobe, apex an acute spine; eighth segment of cauda with a semicircle of two dorsal and two lateral lobes, similarly shaped to above-mentioned lobes and forming with them a complete

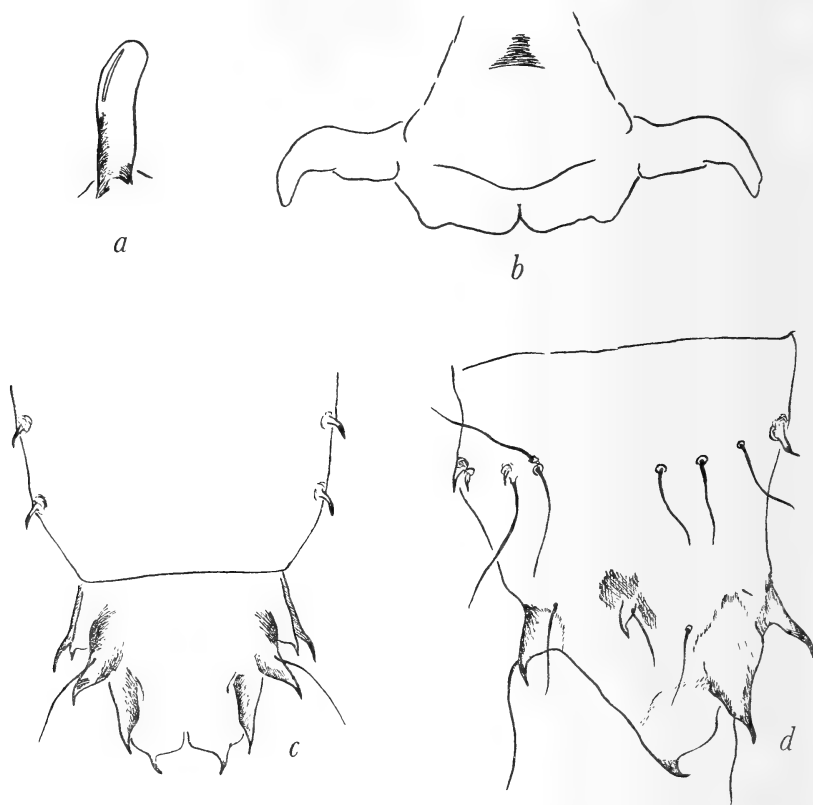


FIG. 49.—*Goniotipula cuneipennis* Alex. Pupa: *a*, breathing horn; *b*, mouth parts; *c*, *d*, cauda ♂, dorsal and lateral views.

ring on dorsum of cauda; within this enclosed area occur two large spiracles near the base of lateral lobes, these latter lobes armed with three elongate setae, two basal and one apical; slightly dorsad on each lateral surface of eighth segment a longer and larger lobe, acute apically, setiferous on outer margin; on venter a large median lobe similarly setiferous; on either side of this lobe an additional seta.

♀ cauda: More truncate, similarly shaped and armed, but with a pair of closely placed lobes on venter of eighth segment.

Localities.—Cape Peninsula: Kirstenbosch (G. A. W., H. G. W.), November 1932; Fernwood (G. A. W., C. W. T., H. G. W.), December 1934.

Cape Province: Caledon (Peringuey), October 1918.

Remarks.—During November 1932 adults were seen swarming over the ground beneath the shady wooded slopes of Skeleton Ravine. The males were present in hundreds and were fluttering over the ground in their unceasing search for the females, which were then emerging from the pupal cases. So great was the reproductive urge that three to four males would cluster around a female, finally dragging her from the pupal “shuck” and copulating while she was still in a teneral condition.

In the following year and in 1934, at Fernwood Ravine, one hundred and sixty fully grown larvae were dug out of the moist rich soil beneath a carpet of rotting leaves. From these numerous male and female imagoes were bred by Mr. Thorne and the author.

Genus LIMONIA Meigen.

1800. p. 15, *Amphinome* (nomen nudum).

1803. p. 262, *Limonia*.

1818. p. 116, *Limnobia*.

Imago.—Terminal joint of maxillary palpus short, not longer than penultimate joint and not whiplike in appearance; no distinct nasus; antennae with 14 joints; anal angle of wing not square and prominent; veins R_4 and R_5 fused as far as wing margin, *i.e.* only two branches of RS being present (figs. 55; 57, *a*; 59, *a*); vein R_2 present; m-cu close to or beyond fork of M—if before, the distance not exceeding length of m-cu itself; RS short, *i.e.* two to three times m-cu, usually arcuated; some species with mouth parts (especially labial palpi) lengthened, the rostrum equal to combined head and thorax; male hypopygium having two dististyles articulating with each basistyle, ventral dististyle large and fleshy, bulbous, longer than basistyle; female ovipositor valves acicular, never reduced.

Larva.—Chaetotaxy nil; form terete, slender; segments of abdomen usually with basal transverse creeping welts bearing microscopic spines; the spiracular disc small (absent in *capicola*), lobeless or lobed—if lobed, the four lobes indistinct or definite according to species; anal gills four; head capsule massive; antennae bi-segmented, second segment usually button-shaped, surrounded by a

few papillae; mandible massive with one to three apical teeth and two to four ventral cutting teeth; maxilla simple, outer lobe haired, with one or more papillae, inner lobe densely haired; labrum broad, pubescent, often with sensory papillae; mentum broad, margin with eleven to thirteen teeth; hypopharynx a collar of two plates, number of teeth according to species.

Pupa.—No cephalic crest; pronotal breathing horns usually flattened and broad; mesonotum bare of spines; abdominal segments with basal transverse welts of hooks and spines on tergites 3–7 and sternites 5–7.

Alexander (1929a, pp. 239–246) suggested the urgent necessity of reducing the diverse genera allied to *Limonia* to the rank of subgenera due to the plasticity of the features of the adult flies. In 1931 (p. 158) he affirmed his suggestion, stating “it is even more difficult to find suitable characters for the definition of these groups in their larvae and pupae.” The present author wishes to confirm this observation. The adults of this genus in the S.W. Cape region are separated easily enough, but the immatures reveal an amazing resemblance which prevents the possibility of retaining the old genera (*Dicranomyia*, *Geranomyia*, *Rhipidia* and *Libnotes*) listed in 1917 and 1921 by Alexander.

Further, the close resemblance of the immatures prevents sub-generic grouping. For instance, the larvae of the S.W. Cape species of *Limonia* can be distinguished only in the number of teeth on the hypopharynx and in the details of the spiracular disc. Consequently, *L. sexocellata* and *L. rubrithorax* (of the former subgenus *Geranomyia*) resemble *L. tipulipes* and *L. peringueyi* (of subgenus *Dicranomyia*) more closely than does *L. capicola* (of subgenus *Dicranomyia*). This is not due to the immediate water distribution and food of the larvae mentioned, for a glance at the following table reveals that in these two respects *L. capicola* is more closely allied to *L. sexocellata*, *tipulipes* and *rubrithorax* than is *L. peringueyi*.

The male hypopygium, which is so useful in the classification of species in other genera, is remarkably uniform within this genus *Limonia*. The basistyles are short and stout, usually prolonged into a conspicuous pubescent ventro-caudal lobe. Each basistyle bears a dorsal, chitinised, curved dististyle and a fleshy, larger, bulbous, pubescent ventral dististyle, the inner basal edge of which is prolonged into a short curved lobe bearing two to three stiff setae. Aedeagus a simple sheath attached to the membranous broad gonapophyses.

In the S.W. Cape the genus *Limonia* comprises eight species, of which six life-histories are herein described. The environment of the immatures is as follows:—

<i>L. capicola</i>	} Rapidly flowing streams under hygropetric conditions.
<i>L. tipulipes</i>	
<i>L. sexocellata</i>	
<i>L. rubrithorax</i>	
<i>L. peringueyi</i>	Decaying logs near forest streams.
<i>L. subapicalis</i>	Decaying humus in tree boles or under decaying bark of trees.

Key to Species of Limonia.

Imagos.

1. Rostrum short (*i.e.* less than combined head and thorax) 2.
Rostrum long (*i.e.* equal to combined head and thorax) 7.
2. Wings with pattern of blotches or spots 3.
Wings unspotted (except for stigma) 6.
3. Wings with dense pattern of spots (*i.e.* spots are distributed over whole surface of wing) (fig. 55, *a*) 4.
Wings with scanty pattern (*i.e.* spots along costal region; not extending to vein M) *tipulipes*.
4. Sc elongate (*i.e.* ends beyond origin of RS) 5.
Sc short (at or before origin of RS) *afra*.
5. Sc ends before fork of RS by a distance equal to basal deflection of R_{4+5} ; RS six times length of basal deflection of R_{4+5} *subapicalis*.
Sc ends beyond fork of RS; RS three to four times length of basal deflection of R_{4+5} *libnotina*.
6. Thorax brownish yellow without distinct stripes *peringueyi*.
Thorax with stripes that are confluent behind *capicola*.
7. Wings with ocellate pattern (fig. 59, *a*) *sexocellata*.
Wings unspotted (except for stigma) *rubrithorax*.

Larvae.

1. Spiracular disc absent; caudal tracheal system terminating dorsally and before end of body *capicola*.
Spiracular disc present; lobed or lobeless, at end of body 2.
2. In rapidly flowing streams under hygropetric conditions 4.
In humus in tree boles or under bark of dead trees 3.
3. Large forms (over 20 mm.); four blunt but distinct lobes round spiracular disc (fig. 53, *c*); hypopharynx with seventeen and twenty teeth on the dorsal and ventral plates *subapicalis*.
Small forms (fully grown, less than 20 mm.); usually not exceeding 15 mm.; no lobes around spiracular disc; hypopharynx with twelve teeth on each plate *peringueyi*.

4. Both plates of hypopharynx with six teeth *sexocellata*.
Both plates with more than six teeth, usually about ten teeth 5.
5. Dorsal plate of hypopharynx with ten teeth, ventral plate
fourteen; spiracular disc with four lobes distinct although
small, each lobe with definite brown mark *tipulipes*.
Both plates with ten teeth; spiracular disc apparently lobeless;
no marks on inside of disc *rubrithorax*.

Pupae.

1. Rostral sheath elongate (fig. 59, *f*) *sexocellata* and *rubrithorax*.
Rostral sheath short (fig. 52, *b*) 2.
2. In rapidly flowing streams under hygroscopic conditions 4.
In humus in tree boles or under bark of dead trees 3.
3. Male and female cauda with prominent lateral lobes (fig. 54, *e, f*) *subapicalis*.
Male and female cauda without such lobes *peringueyi*.
4. Male and female cauda with conspicuous dorsally curved spines
(fig. 52, *f, g*) *tipulipes*.
Male and female cauda without any prominent spine *capicola*.

Limonia tipulipes (Karsch).

Figs. 50-52.

1886. pp. 51-52.

1917. Alexander, pp. 141-142, pl. x, fig. 3 (wing) (*Dicranomyia*).1921. *Id.*, p. 181 (*Dicranomyia*).

Much conflict of opinion has arisen concerning the position of Sc_2 in this species (Edwards, 1912, p. 197; Bergroth, 1913, p. 580; Alexander, 1917, pp. 141-142). This has been due to the scanty material at the disposal of these authors (Edwards and Bergroth one each; Alexander six specimens). The issue was further complicated by loose statements by some authors in their earlier works, e.g. "position of Sc_2 is placed close to the tip of Sc_1 " (Bergroth, 1913, p. 580) and " Sc_2 is considerably removed from tip of Sc_1 ." The distance of separation should be referred to some suitable norm, e.g. "distance being equal to the entire radial sector" (Alexander, 1917, p. 141), or " Sc_2 before origin of RS by twice the thickness of that vein" (this report), and should be accompanied by a *camera lucida* projection of the wing, as a freehand drawing permits too large a personal error.

As suggested by Alexander (1917, p. 141), the study of more material

has thrown considerable light on the position of Sc_2 , which is the main distinguishing character between *Limonia* (*Dicranomyia*) *confinis* Bergroth and *Limonia* (*Dicranomyia*) *tipulipes* Karsch. Bergroth writes (1913, p. 580), "this character is not subject to variations in the species of *Dicranomyia*, but is quite constant." The examination

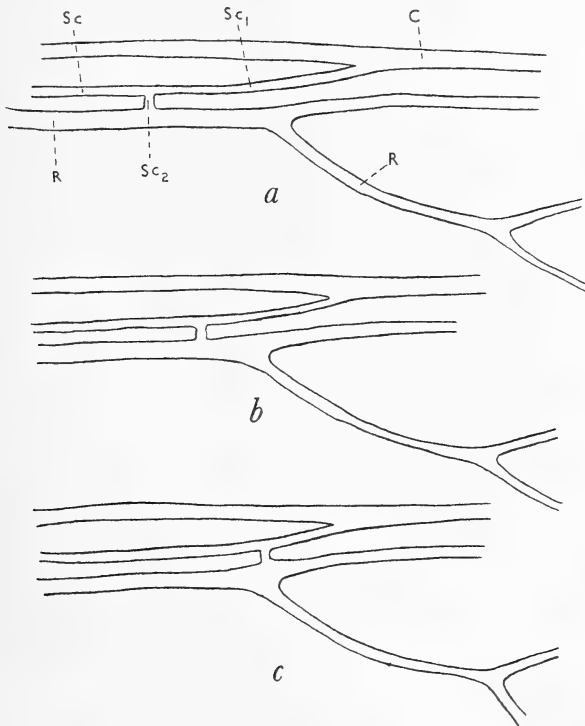


FIG. 50.—Wings of *Limonia tipulipes* (Karsch), showing types *a*, *b*, and *c*.

by the author of a series of 316 wings of *tipulipes* revealed that three main types of venation exist (fig. 50):—

- type *a*: Sc_2 before origin of RS by two-thirds the length of RS,
- type *b*: Sc_2 before origin of RS by thickness of vein Sc_1 ,
- type *c*: Sc_2 opposite origin of RS.

Other specimens show the gradual transition from one type of wing to another.

These results show that:

- (1) the position of Sc_2 is NOT constant in this species as stated by Bergroth;

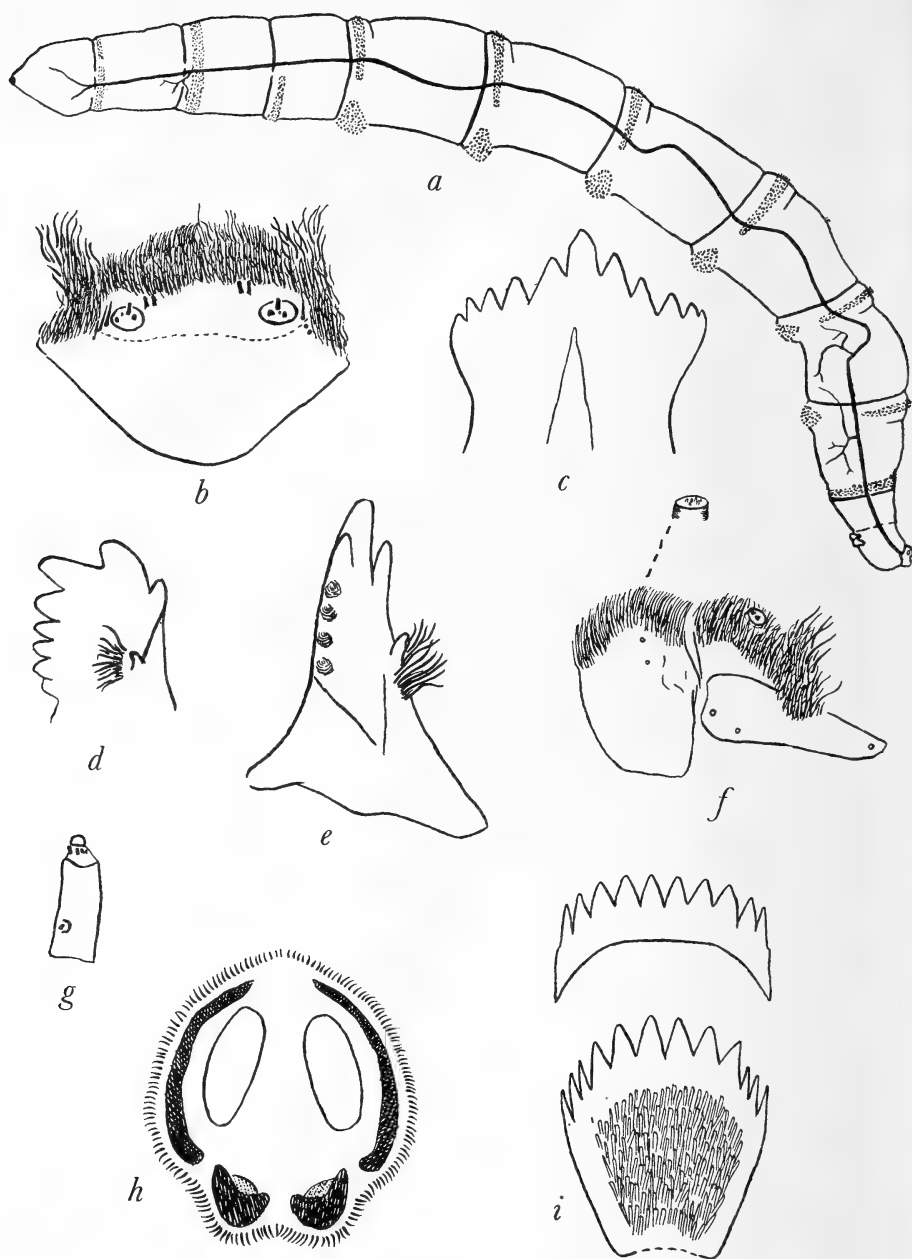


FIG. 51.—Larva of *Limonia tipulipes* (Karsch). *a*, lateral view of larva; *b*, dorsal view of labrum; *c*, mentum; *d*, mandible apex (lateral view); *e*, mandible (dorsal view); *f*, maxilla; *g*, antenna; *h*, spiracular disc; *i*, hypopharynx.

- (2) it cannot *per se* differentiate between two closely allied species;
- (3) Bergroth probably examined a *tipulipes* with type c wing;
- (4) Alexander was hasty in denouncing Bergroth's observation for that type of wing when he (Alexander) was examining type a;
- 5) *Limonia* (*Dicranomyia*) *confinis* Bergroth is conspecific with *Limonia* (*Dicranomyia*) *tipulipes* Karsch.

Localities.—As for *Limonia capicola* (p. 185).

Also: Stellenbosch (Peringuey, 1887); Ceres (Lightfoot, 1913); Orange Free State, Transvaal, Natal, and South West Africa. See Alexander, *l.c.*

Larva.—Length 12–13 mm., diameter 1 mm. Colour dirty white, often with an underlying green tinge in living specimens; creeping welts rich brown and therefore relatively conspicuous against the body colour; integument with microscopic appressed pale brown pubescence. Main tracheal system conspicuous through the integument as two dark brown tubes commencing at the spiracles, continued forwards on each side as a long undulating tube.

Body (fig. 51, *a*) terete, form slender, the first seven sternites of abdomen with a conspicuous basal transverse fusiform welt, densely armed with microscopic spines; dorsal welts narrow, striplike, occurring on abdominal segments 2–7, a conspicuous ring of microscopic hooks on the posterior margin of abdominal segment 7; on meso- and metathorax an indication of dorsal and ventral creeping folds, those on the latter segment forming a complete ring.

Chaetotaxy nil. Spiracular disc (fig. 51, *h*) small, the two dorso-lateral lobes blunt but definite in outline, edged with dark brown, fringed with short, stiff, black hairs; ventral lobes smaller, with two dark brown semi-circular areas, similarly fringed with hairs; the large elliptical spiracles dark brown, capable of close approximation under water in times of stress. Anal gills four, white, long, indistinctly trisegmented.

Head capsule massive, large, retractile, of *Limonian* type. Antenna (fig. 51, *g*) bi-segmented, first segment twice as long as its greatest diameter, cylindrical, chitinised, with a basal auditory plate, second segment reduced, buttonlike, surrounded by three to four sensory papillae. Mandible (fig. 51, *e*) broad, massive, with a blunt apical tooth slightly longer than the tooth on either side of it; ventral cutting-edge with four blunt teeth which become smaller towards the base of the mandible; inner face of mandible bearing a subacute prosthecal tooth and a fringe of coarse setae. Maxilla (fig. 51, *f*):

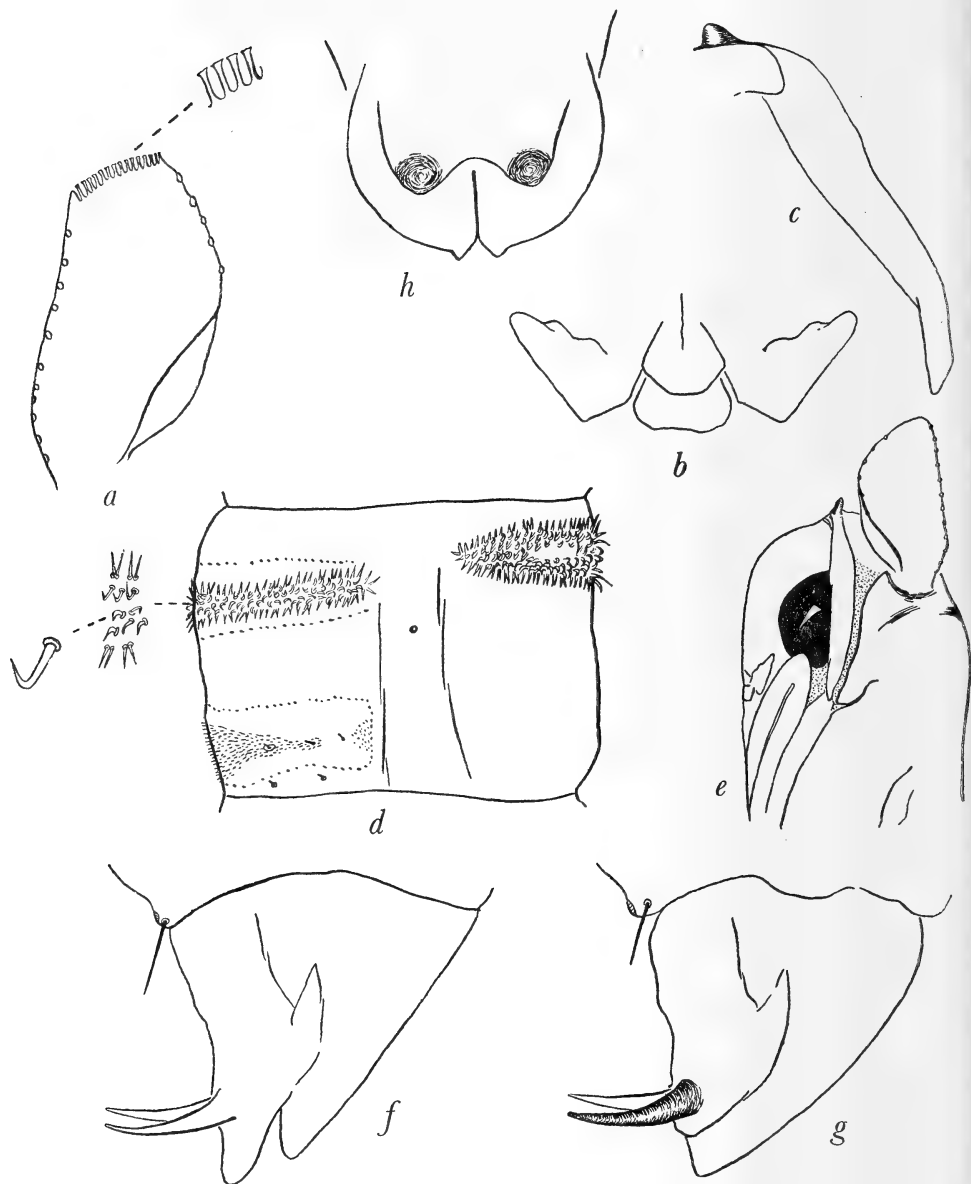


FIG. 52.—Pupa of *Limonia tipulipes* (Karsch). *a*, pronotal breathing horn, with apex enlarged; *b*, mouth parts; *c*, antennal sheath; *d*, abdominal segment five (lateral view), with further enlargement of hooks and spines; *e*, anterior portion of pupa (lateral view); *f*, female cauda (lateral view); *g*, male cauda (lateral view); *h*, male cauda (dorsal view).

cardo distinct, with three setae; outer lobe margined apically with dense setae in which occurs a large palpus, bearing about five minute papillae; inner lobe smaller, densely haired, with a small apical palpus. Labrum (fig. 51, *b*) subtriangular, anterior margin broad, fringed with delicate hairs, those at the lateral margin coarser and longer; near anterior margin two ringlike hyaline areas, each with three to four minute sensory papillae; adjacent to each a group of two sensory papillae; laterad to the ring three distinct setae; epipharyngeal surface pubescent. Hypopharynx (fig. 51, *i*) a collar of two chitinated plates, the dorsal plate striplike, with ten sharp slender teeth; ventral plate much larger, anterior margin having fourteen sharp teeth, the outer tooth on either side slender, often difficult to determine, ventral surface of plate with numerous scalelike setae. Mentum (fig. 51, *c*) conspicuous, broad, deeply cleft behind, anterior outline with a large median tooth, each side with five subacute teeth.

Pupa.—Length 8 mm., diameter 1 mm. Body devoid of prominent setae. Thorax deep warm brown, abdominal segments pale cream deriving a brown tinge from the transverse bands of chitin and in living specimens tinged with green; pronotal breathing horns light brown, the two tracheal tubes conspicuous through the integument, underlying abdominal segments 4–6; wing pads and leg sheaths brown to black in mature pupae; cauda dark brown, heavily chitinated.

Labrum (fig. 52, *b*) broad, apex semi-truncate; labial lobes almost straight across, rounded laterally; maxillary palpi narrowed towards tips, anterior margins undulating. Antennal sheaths (fig. 52, *c*) armed with a single chitinated tubercle at origin, extending to base of wing pad, apex tapering abruptly.

Thorax convex; each pronotal breathing horn (fig. 52, *e*) an elongate-oval flattened lobe, directed towards head, a row of breathing pores (hyaline areas) along both margins, apical region of lobe evidently a large slitlike pore reinforced with numerous chitinous columns. Leg sheaths ending opposite end of basal annulus of abdominal segment 4; wing pads opposite end of abdominal segment 2.

Tergites of abdominal segments 1–2 with rectangular transverse chitinated areas; segments 3–7 subdivided into two annuli: the basal annulus of tergites 3–7 and sternites 5–7 with transverse welt densely covered with hooks or crochets, margined by straight spines, the tergal welts surrounded by a narrow strip of chitin (fig. 52, *d*); sternite 4 having incomplete welts on either side of leg sheaths; posterior annuli of tergites 3–7 with a broad chitinated area bearing

microscopic points of indefinite distribution in which are four widely spaced setae, an additional two setae further caudad, posterior annuli of sternites 4-7 bare, of sternite 8 with a rectangular chitinised area with four setae, posterior margin of this sternite having a transverse welt of hooks. A pair of spiracles on dorsum of segment 8, laterad of each a seta; pleura of segments 3-7 with a minute spiracle.

♂ cauda: Dorsal view (fig. 52, *h*) shows sternal sheaths bulbous, rounded, inner apical angles dilated slightly; tergal sheaths reduced, the spine not apparent from this view; lateral view (fig. 52, *g*) shows sternal sheaths large; tergal sheaths reduced, prolonged into a strong elongate spine curved dorsad.

♀ cauda: Tergal sheaths slender, contiguous along median line, sternal sheaths hidden (dorsal view); sternal sheaths shorter than tergal sheaths, each of which is produced into the curved spine (fig. 52, *f*).

Remarks.—The immatures of this species inhabit slime tubes on the surfaces of rocks in streams, where they are covered by a thin film of flowing water. The larvae create these tubes over small irregularities and crevices in the boulders, rendering them inconspicuous by an intermixture of moss and other vegetable fragments. The tubes are longer than the larvae and, being open at both ends, afford a double exit for the larvae, which, when disturbed, wriggle with considerable agility across the surface of the rock. Should a larva be unable to retrace its route, it will set about making another slime tube in the nearest convenient crevice. The pupae frequent the upper regions of the rock where the mossy growth is thicker and which affords a safe anchorage for the slime tube. The strong curved spines on the cauda of the pupae are probably to fix them firmly in the slime tubes in the event of adverse conditions, such as the sudden rise of the stream level.

These spines are of primary importance, especially in the field, for distinguishing the pupae of this species from those of closely allied species, e.g. *Limonia sexocellata* and *Limonia capicola*.

Limonia afra (Bergroth).

1888. pp. 128-129 (*Rhipidia*).

1917. Alexander, p. 143, pl. x, fig. 5 (wing) (*Rhipidia*).

1921. *Id.*, p. 184 (*Rhipidia*).

Alexander figured the wing for the first time.

Localities.—Cape Peninsula: Fernwood (C. W. T.), November 1933;
Nursery Ravine (H. G. W.), November 1932;
Kirstenbosch (K. H. B., H. G. W.), November 1933.
Cape Province: Landdrost (K. H. B.), 1917.
Eastern Province and Natal (Alexander, *l.c.*).

Remarks.—These flies were found associated with *Limnophila dubiosa* (Kirstenbosch and Fernwood). It is probable that the immatures frequent a similar if not identical type of habitat.

Limonia subapicalis (Alex.).

Figs. 53, 54.

1917. pp. 143–144, pl. x, fig. 6 (wing) (*Libnotes capensis*).

1925b. p. 1007 (*Limonia subapicalis*) (*Limonia capensis* preoccupied by Macquart, 1838).

Localities.—Cape Peninsula: Fernwood (G. A. W., H. G. W.),
July 1937; (C. W. T.) December 1937; Cecilia
Waterfall (G. A. W., H. G. W.), December 1936.

Cape Province: Oudebosch (K. H. B., C. W. T.,
H. G. W.), January 1934; (G. A. W., C. W. T.,
H. G. W.) September 1937.

Natal (Alexander, *l.c.*, 1917).

Larva.—Length 24–26 mm., diameter 1·7–2 mm. Colour dirty white with an underlying green tinge, creeping welts rich brown, integument transparent, shiny, revealing the black alimentary contents from the first abdominal segment to the anus, and the main tracheal system of two lateral tubes; preserved specimens dirty cream, no green tinge or tracheal system visible.

Body elongate, form slender. Abdominal segments bear on tergites 2–7 and sternites 1–7 a basal transverse fusiform creeping welt covered with microscopic spines, the dorsal welts and that of sternite 1 narrow, striplike; posterior margin of segment 7 with a complete ring of microscopic spines; on venter of metathorax a scurfy creeping fold.

Chaetotaxy nil. Spiracular disc (fig. 53, *c*) large, four blunt but distinct lobes, fringed with microscopic black hairs, the two ventral lobes slightly larger than the dorso-lateral pair, the obliquely placed

spiracles slightly wider at the ventral end; inner face of ventral lobes with a narrow clavate black mark. Anal gills four, white; dorsal pair stout, large; ventral pair twice as long, tapering.

Head capsule massive, of *Limonian* type. Antenna bi-segmented, first segment twice as long as broad, second segment extremely

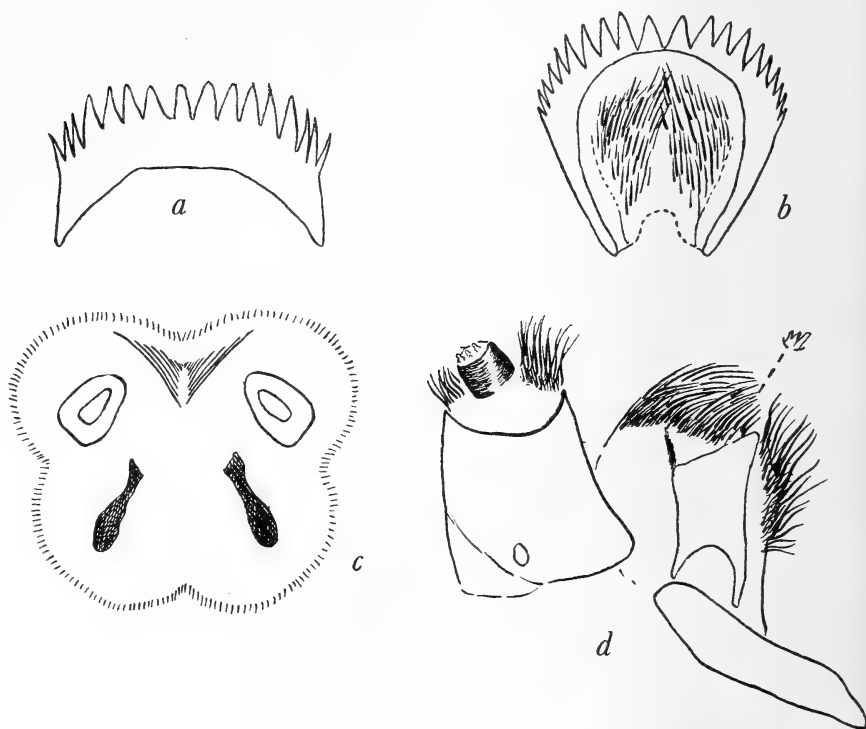


FIG. 53.—Larva of *Limonia subapicalis* (Alex.). a, dorsal plate of hypopharynx; b, ventral plate of hypopharynx; c, spiracular disc; d, maxilla.

reduced, ringlike, with about three microscopic sensory papillae. Mandible similar to that of *L. tipulipes*, but with three ventral cutting teeth, the last tooth square, less prominent than the first two teeth. Maxilla (fig. 53, d): cardo striplike, distinct; outer lobe having a large apical palpus with about three sensory papillae, on either side a tuft of coarse setae; inner lobe densely haired apically, three closely placed papillae near inner anterior corner. Labrum oval, anterior margin broad, fringed with hairs; near this margin two ringlike areas with two to three papillae; epipharyngeal surface pubescent. Hypo-

pharynx (fig. 53, *a*, *b*) a collar of two plates, the dorsal with sixteen teeth, the ventral plate with twenty sharp teeth, the three outer teeth on each plate more slender and sharper, ventral surface of ventral plate with slender scalelike setae. Mentum broad, deeply cleft behind, anterior margin with a large median tooth, each side with five subacute teeth.

Pupa.—Length 15 mm., diameter 2 mm. Thorax warm brown, abdominal segments pale cream, in living specimens tinged with vivid green; welts and cauda dark brownish yellow.

Cephalic crest lacking (fig. 54, *b*). Labrum (fig. 54, *d*) broad, very obtusely rounded at apex; labial lobes broad, caudal margin slightly indented; maxillary palpi tapering to pointed apices. Antennal sheath (fig. 54, *c*) extending to wing base, slender, with three chitinated protuberances at origin. Thoracic pronotum convex, with a low chitinated carina between breathing horns, which are chestnut brown, elongate, curved, flattened against the thorax, gradually narrowed to the blunt tips, margins serrate, upper surface with numerous microscopic pores, distributed chiefly along outer margin (fig. 54, *a*, *b*). Leg sheaths ending midway between abdominal segments 3 and 4, sometimes between 4 and 5; wing pads opposite end of segment 2.

Chaetotaxy nil. Abdomen with tergites of segments 1–2 slightly chitinated; segments 3–7 subdivided into two annuli; basal annulus of tergites 3–7 and sternites 5–7 with a transverse welt densely covered with hooks and crochets, margined by straight sharp spines; sternites 3 (rarely) and 4 having incomplete welts on either side of leg sheaths; posterior annuli of tergites 3–7 and sternites 4–7 with broad strip of chitination.

♂ cauda (fig. 54, *f*): Anterior margin of dorsal sheaths with a black, heavily chitinated, triangular structure, apex bearing four short setae; dorsal sheaths short, inconspicuous; ventral sheaths prominent, bluntly bifid apically; inner bifurcation slightly produced, lateral surfaces with a large rounded lobe.

♀ cauda (fig. 54, *e*, *g*): The black chitinated structure with sixteen moderate setae; dorsal sheaths tapering, bluntly rounded, less narrow than ventral sheaths, lateral surface having a flat top or lobe; ventral sheaths broad, tapering slightly, then swelling into two small lobes (fig. 54, *e*).

Remarks.—One habitat of the immatures of this fly is strikingly similar to that of *Limonia* (*Libnotes*) *perkinsi* Grimsh., which was bred from decaying vegetation and the accumulation of debris behind

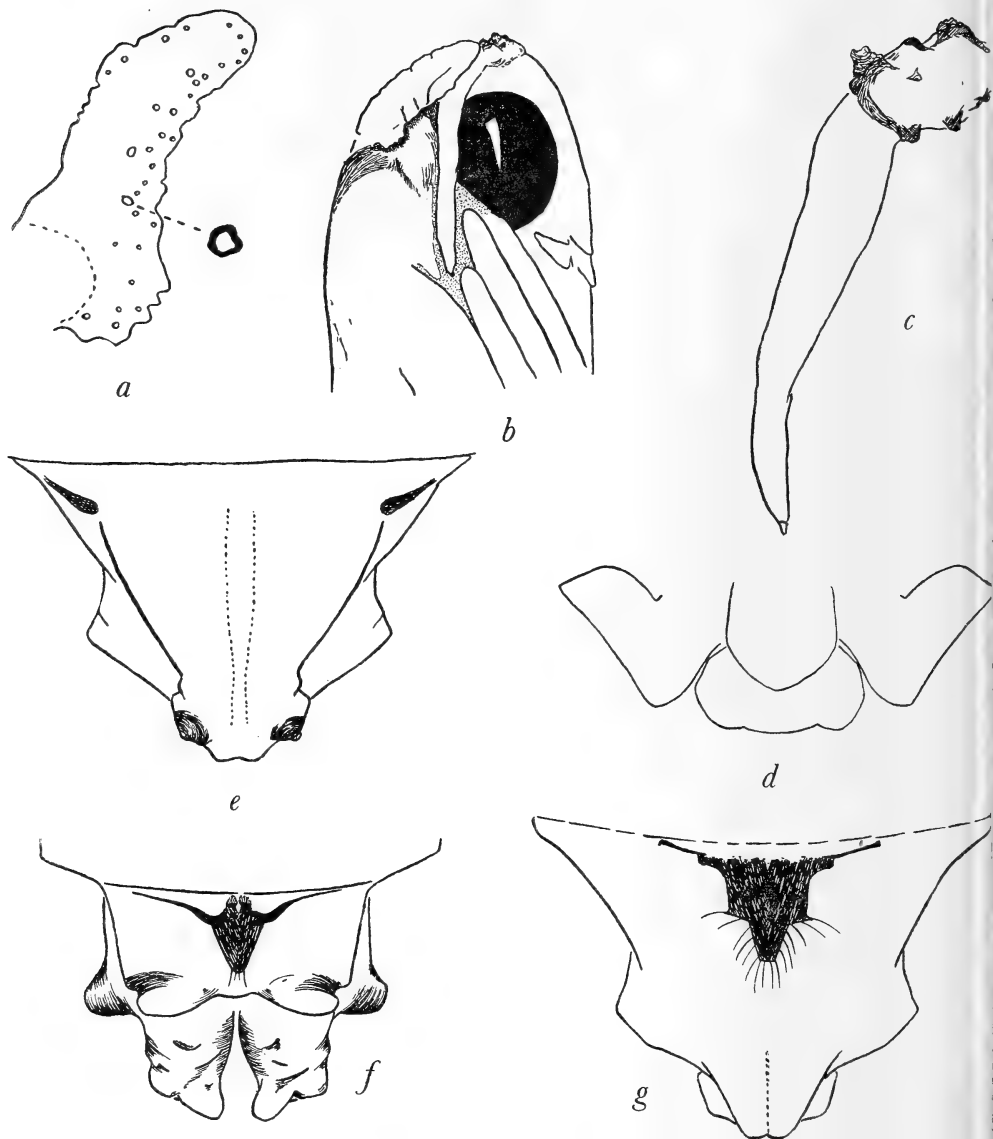


FIG. 54.—Pupa of *Limonia subapicalis* (Alex.). *a*, pronotal breathing horn, with enlargement of one pore; *b*, anterior portion of pupa (lateral view); *c*, antennal sheath; *d*, mouth parts; *e*, female cauda (ventral aspect); *f*, male cauda (dorsal aspect); *g*, female cauda (dorsal aspect).

old leaf sheaths on banana plants in the Hawaiian Islands by Swezey (Alexander, 1920*a*, p. 815).

The presence of an adult fly near a tree bole at Oudebosch (January 1934) provided a clue to the habitat of the immatures. Several handfuls of debris were extracted from the bole. In this damp rotting humus occurred numerous elongate larvae in various stages of development. These were bred. The slimy shiny larvae actively burrow through the humus, feeding as they go. Prior to pupation, however, the larva secretes a tube of glutinous saliva round minute pieces of debris, thus forming a black woody cocoon, wherein it changes. The old larval skin remains at the bottom of the tubelike cocoon. Duration of pupal stadium is six to seven days. This type of habitat is rare in the S.W. Cape area, where true forest is limited, and the fast disappearing indigenous bush confined to the kloofs and ravines.

At Fernwood Ravine (July 1937) Mrs. Wood, Mr. Thorne and the author gathered many larvae of this species, which occurred throughout a saturated rust-coloured scum beneath the bark of a fallen poplar tree. Many imagoes were bred.

In September 1937, at Oudebosch, were found larvae and pupae in a fallen log of *Halleria capensis* (Wild Fuchsia; Oudehout) in a similar rust-coloured scum beneath the crumbling bark. Associated with the immatures were numerous larvae of *Elephantomyia montana*.

In the two above-mentioned logs pupation occurred just beneath the surface of the log, no glutinous cocoon or tube being secreted. The tree-bole habitat of January 1934 was revisited, but it provided no immatures as the humus was extremely saturated and unsuitable.

Limonia libnotina Alex.

Fig. 55, *a*.

1934. pp. 50-52.

The wing is figured here for the first time (fig. 55, *a*).

Localities.—Cape Peninsula: Nursery Ravine (G. A. W.), March 1932; Fernwood Ravine (G. A. W., C. W. T., H. G. W.), July 1937.

Cape Province: Oudebosch (C. W. T., H. G. W.), January 1934; (Lightfoot) December 1920.

Remarks.—The immatures of this species are unknown.

Limonia peringueyi (Alex.).Figs. 55, *b*; 56.1917. Alexander, pp. 142–143 (*Dicranomyia*).1921. *Id.*, p. 182 (*Dicranomyia*).

The type (without definite locality) seems to be somewhat discoloured, being darker in colour than the fresh specimens (see

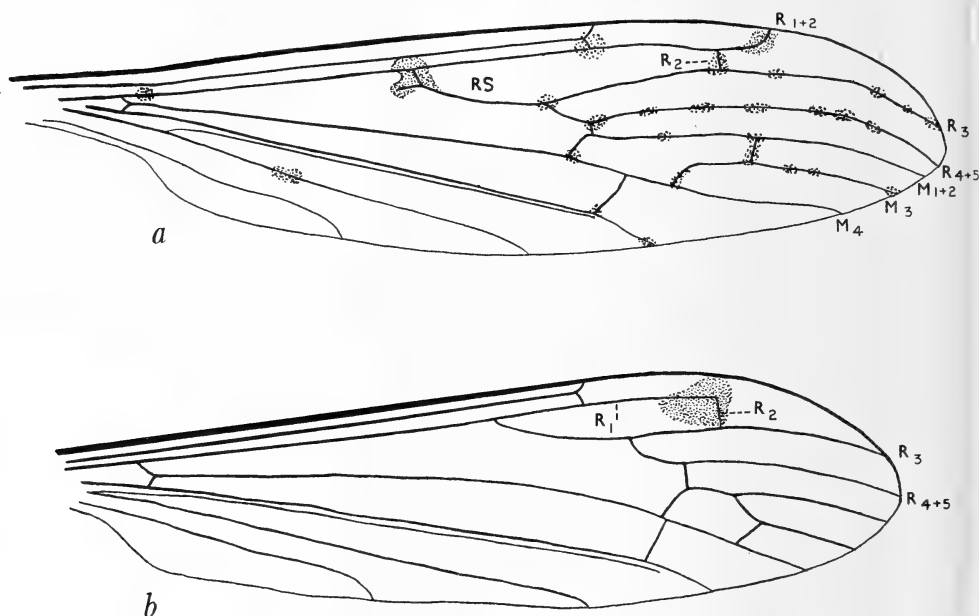


FIG. 55.—*a*, wing of *Limonia libnotina* Alex.; *b*, wing of *Limonia peringueyi* (Alex.).

Alexander's note, 1921, p. 182). The description of the body colour is consequently misleading. Freshly caught specimens of this fly are unicolourous, being a pure sulphur yellow except for the black head, the tergites of the abdomen being lightly tinged with brown. The thoracic praescutum is unstriped.

The wing (fig. 55, *b*) is here figured for the first time.

Localities.—Cape Peninsula: Fernwood (C. W. T.), November 1934; Orange Kloof (K. H. B., H. G. W.), March 1932; Wynberg Caves (near entrance) (K. H. B.), March 1931.

Cape Province: Jonkershoek (H. G. W.), July 1931;
Oudebosch (C. W. T., H. G. W.), September 1933,
January 1934; River Zonder End Peak (H. G. W.),
December 1931.

Larva.—Length 11–12 mm., diameter .6–.8 mm. Colour dirty white, creeping welts little chitinised and therefore relatively inconspicuous, pubescence of body microscopic, pale.

Body terete, form slender; anterior margin of meso- and meta-thoracic sternites with a scurfy creeping fold; abdominal sternites 1–7 and tergites 2–7 with creeping welts as in this genus, those on the tergites narrow, striplike; the welts are not as definite in outline nor as heavily armed with short hooks as in *Limonia tipulipes* or *Limonia sexocellata*.

Chaetotaxy nil. Spiracular disc small, apparently lobeless even under high magnification, the edge of disc with a scanty fringe of minute hairs; spiracles ovoid, the ventral end slightly wider, central portion minute. Anal gills white, small, short, bluntly rounded apically.

Head capsule as in genus; remarkably similar in general appearance and structure to that of *Limonia tipulipes*. Hypopharynx a collar of two plates, each with twelve marginal teeth, the lateral pair on each plate more slender and sharper than the inner subacute teeth; ventral plate with scalelike setae.

Pupa.—Length 8 mm., diameter .5–.7 mm. Body devoid of prominent setae. Thorax yellow, abdominal segments white; breathing horns pale brown; wing pads and legs yellowish brown.

Labrum (fig. 56, *b*) broad, rounded; each labial lobe semi-circular; maxillary palpi angulate at margin near base, tapering, apex bluntly rounded. Antennal sheath (fig. 56, *c*) unarmed, narrow, apex slightly split, extending to base of wing pad.

Thorax convex. Each pronotal breathing horn (fig. 56, *a*, *d*) a flattened lobe, directed forwards, slightly wrinkled transversely, apparently without pores along the margin, apex narrow, bluntly rounded. Leg sheaths V-shaped, ending half-way on abdominal segment 4; wing pads half-way on segment 2.

Tergites of abdominal segments 1–2 with slight chitinised rectangular areas; segments 3–7 subdivided into two annuli; basal annulus of tergites 3–7 and sternites 5–7 with the usual transverse welt of hooks and margination of straight spines; sternite 4 having incomplete welts on either side of leg sheaths; posterior annulus of tergites and sternites bare; posterior margin of segment 7 lined by a narrow welt of hooks and crochets.

♂ cauda (fig. 56, e): Tergal sheaths small, extending towards lateral regions of cauda, posterior margins rounded; sternal sheaths not bulbous, apices gently rounded.



FIG. 56.—Pupa of *Limonia peringueyi* (Alex.). a, pronotal breathing horn; b, mouth parts; c, antennal sheath; d, anterior portion of pupa (lateral view); e, male cauda (dorsal view); f, female cauda (lateral view).

♀ cauda (fig. 56, f): Tergal sheaths are somewhat longer and more distinct than the sternal sheaths.

Remarks.—At Fernwood Ravine Mr. Thorne found these immatures in a decaying log (November 1934). The larvae are wood-feeders and tunnel throughout the log. Immediately before pupation they gather together pieces of chewed wood and even the “fras,” with which they impregnate the jelly tube secreted by the salivary glands. Within this tube pupation occurs.

Limonia capicola (Alex.).

Figs. 57, 58.

1921. p. 183 (*Dicranomyia*).

This common fly is easily recognised by the wing pattern (fig. 57, *a*) and by the coloration of the mesonotal praescutum, which is brown with the brownish-black median and shorter lateral stripes confluent behind. The whole disc is therefore almost of this brownish-black colour.

Localities.—Cape Peninsula: Kasteels Poort (K. H. B., H. G. W.), August 1932; Echo Valley (K. H. B., H. G. W.), February 1932; April 1932; October 1932; Platteklip (H. G. W.), January 1932; (K. H. B., H. G. W.) March 1930; (K. H. B.) April 1932; Lekkerwater (H. G. W.), January 1932; Kirstenbosch (K. H. B., H. G. W.), November 1932; Orange Kloof (H. G. W.), January 1933.

Cape Province: Oudebosch (K. H. B.), December 1928; Sneeuwgat (K. H. B.), September 1932; Wolvenhoek Kloof (K. H. B.), April 1931; Palmiet River (H. G. W.), March 1932; George (K. H. B.), January 1931; Witte River (K. H. B., H. G. W.), November 1933; Riversdale (K. H. B.), October 1922; Lemoenshoek (K. H. B.), November 1927; Waaihoek Kloof (K. H. B.), April 1928; Steenbras (H. G. W.), November 1932; French Hoek Pass (H. G. W.), January 1935; French Hoek Pass (East side) (H. G. W.), October 1933; Meirings Poort (K. H. B., C. W. T.), October 1937; Krom River (K. H. B.), September 1935; Bains Kloof (K. H. B., H. G. W.), April 1933; Zwartberg Pass (K. H. B., C. W. T., H. G. W.), February 1932; Landdrost (K. H. B., C. W. T., H. G. W.), November 1933.

Larva.—Length 16 mm., diameter .9 mm. Colour dirty white, creeping welts rich brown and therefore conspicuous against the body colour, distribution of welts as in *Limonia tipulipes*.

Body terete, form slender, ultimate segment slightly prolonged dorsally (fig. 57, *b, c*), spiracular disc *absent*, tracheal system clearly visible from end of abdominal segment 7, posterior extremity of

system just beneath integument and partially surrounded by crescent-shaped chitinised area, actual spiracles (if present) difficult to detect even under high magnification. Anal gills four, large, fleshy, rounded lobes.

Chaetotaxy nil. Head capsule massive, of *Limonian* type, closely resembling that of *Limonia tipulipes*. Hypopharynx (fig. 57, *d*) of

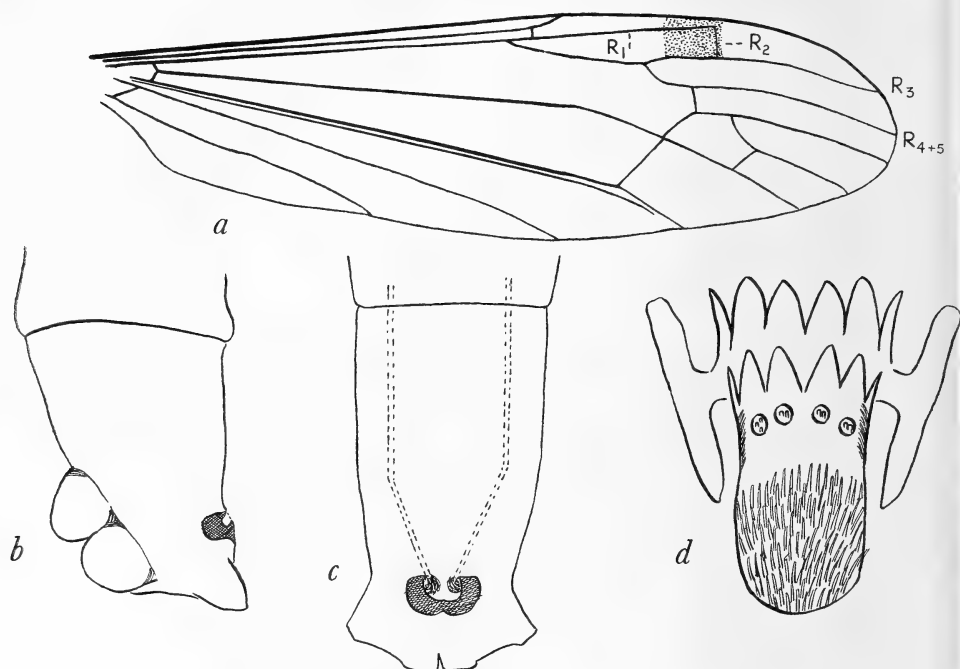


FIG. 57.—*Limonia capicola* (Alex.). *a*, wing of imago; *b*, end of abdomen of larva (lateral view); *c*, ditto (dorsal view); *d*, hypopharynx.

two plates, each with six teeth, each outer tooth sharper, more slender; ventral surface of ventral plate with numerous scalelike setae, anterior of which are four circular areas bearing minute papillae. Labrum as in *Limonia tipulipes*, but each lateral corner bears a prominent curved papilla.

Pupa.—Length 9 mm., diameter .9–1 mm. Body devoid of prominent setae. Thorax dark brown, abdominal segments dirty white, deriving a brown tinge dorsally in mature pupae from the deposition of chitin; breathing horns dark brown.

Labrum (fig. 58, *d*) semi-circular; labial lobes almost straight

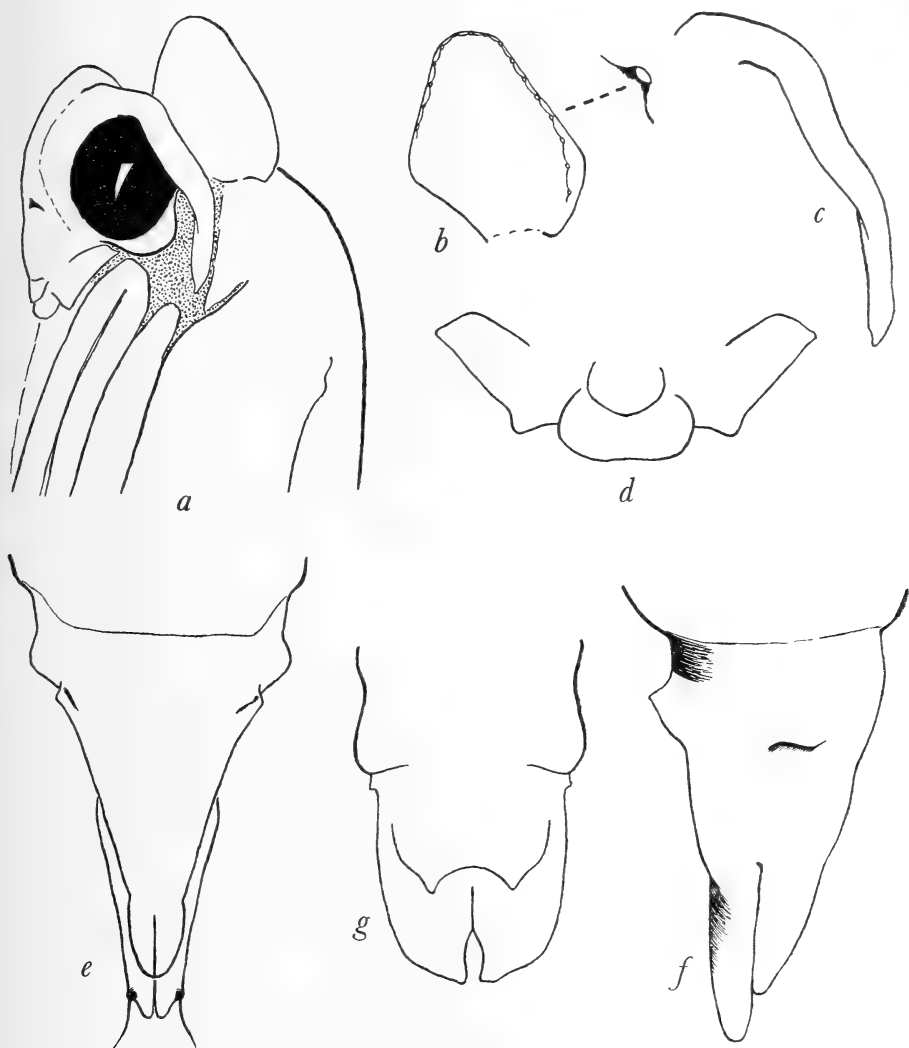


FIG. 58.—Pupa of *Limonia capicola* (Alex.). *a*, head portion of pupa; *b*, breathing horn; *c*, antennal sheath; *d*, mouth parts; *e*, female cauda (ventral aspect); *f*, female cauda (lateral aspect); *g*, male cauda (dorsal aspect).

across, rounded laterally; maxillary palpi narrowed towards tips, strongly angulated at base on posterior margin. Antennal sheath (fig. 58, c) extending almost to base of wing pad, strongly curved near origin, apex tapering abruptly. Thorax convex. Each pronotal breathing horn (fig. 58, a, b) an oval flattened lobe, directed towards head; ventral basal angle hidden by antennal sheaths; a row of sixteen pores along both margins. Leg sheaths ending half-way on abdominal segment 4; wing pads opposite end of segment 2.

Tergites of abdominal segments 1-2 with transverse strip of chitin; basal annulus of tergites 3-7 and sternites 5-7 with a transverse welt of hooks and crochets, the tergal welt surrounded by strip of chitin; posterior annulus of tergites 3-7 and sternite 7 with a narrow transverse strip of chitin (visible only in mature pupae), of sternites 4-6 bare; sternite 4 with incomplete welts on either side of leg sheaths; posterior margin of segment 7 armed with a narrow ring of spines.

♂ cauda (fig. 58, g): Tergal sheaths reduced, margin between with a blunt U-shape, each sheath tapering; ventral sheaths bulbous, conspicuous, inner apical angle slightly produced (dorsal view); tergal sheaths lie flat against the larger sternal sheaths (lateral view).

♀ cauda (fig. 58, e, f): Sternal sheaths tapering gradually to a slight constriction, then swollen somewhat to bluntly rounded apices, smaller than the tergal sheaths which carry apically a seta (ventral view); tergal sheaths the larger, fingerlike, bearing a prominent fleshy tubercle near the origin (lateral view).

Remarks.—Pupae of this species were discovered near the Sneeuwgat Nek by Mr. Thorne and the author (October 1934), but, in spite of many searches in the correct habitat, only in July 1937 were the larvae found at Kasteels Poort, on moss along the edges of the rapidly flowing streamlet, by Mrs. Wood. Several imagoes were bred from this material.

The larvae are readily distinguished from those of the closely allied species *Limonia tipulipes*, *L. sexocellata* and *L. rubrithorax* by the absence of a spiracular disc.

Limonia sexocellata (Alex.).

Fig. 59.

1921. pp. 185-186 (*Geranomysia*).

The holotype is a female, as stated by Alexander on page 186, although his description on page 185 is labelled male. This fly is

widespread in the S.W. Cape area, being recognisable by the ocellate pattern of the wing (fig. 59, *a*).

Localities.—As for *Limonia capicola* (p. 185).

Larva.—Length 13–14 mm., diameter 1 mm. Colour dirty yellowish brown, creeping welts slightly darker brown and relatively inconspicuous against body colour, integument with microscopic appressed pubescence. Main tracheal system indistinct through integument.

Body terete, form slender, salivary glands conspicuous through the venter of meso- and metathorax, which are devoid of a creeping welt or fold; the first seven abdominal segments with a basal transverse welt of microscopic hooks; the dorsal narrow striplike welts occurring on abdominal segments 2–7; segment 7 having on the posterior margin a ring of spines.

Chaetotaxy nil. Spiracular disc (fig. 59, *c*) small, lobes apparently absent, the elongate-elliptical spiracles dark brown, capable of close approximation under water. Anal gills four, ventral pair longer than dorsal pair, tri-segmented, dull brown.

Head capsule (fig. 59, *b*) massive, typically *Limonian*. Hypopharynx (fig. 59, *d*) of two plates, each with six marginal teeth. This is the only distinguishing feature between the head capsule of this species and that of *L. tipulipes* and *L. rubrithorax*. These observations again show the impossibility of differentiation between the larvae of the former genera *Geranomyia* and *Dicranomyia*.

Pupa.—Length 10 mm., diameter 1–1.2 mm. Body devoid of setae. Similar in colour to that of *Limonia tipulipes*. Frons (fig. 59, *f*) triangular, apex produced, slender, rostral sheath long, narrow, subtended on either side by the paraglossal sheaths, which project far beyond the tip of the rostrum; maxillary palpi thick and stout at origin, blunt, fingerlike at apex, slightly curved. Antennal sheath (fig. 59, *f*) unarmed, extending to base of wing pad, apex tapering abruptly.

Thorax convex. Pronotal breathing horns (fig. 59, *e*) elongate flattened lobes, directed inwards and forwards, transversely wrinkled, margined by several pores (hylaine areas), which are distinct on dorsal edge. Leg sheaths end opposite posterior margin of abdominal segment 3; wing pads opposite end of segment 2.

Abdominal welts and chitination as in pupa of *L. capicola*; sternite 4 having incomplete basal welts.

♂ cauda (fig. 59, *g*): Tergal sheaths reduced, margin between a deep U-shaped notch, each sheath conical, bluntly rounded; ventral sheaths bulbous, apices bluntly pointed, not rounded.

♀ cauda: Similar to that of *L. capicola*, but without the prominent fleshy tubercle at the origin (cf. fig. 58, e, f).

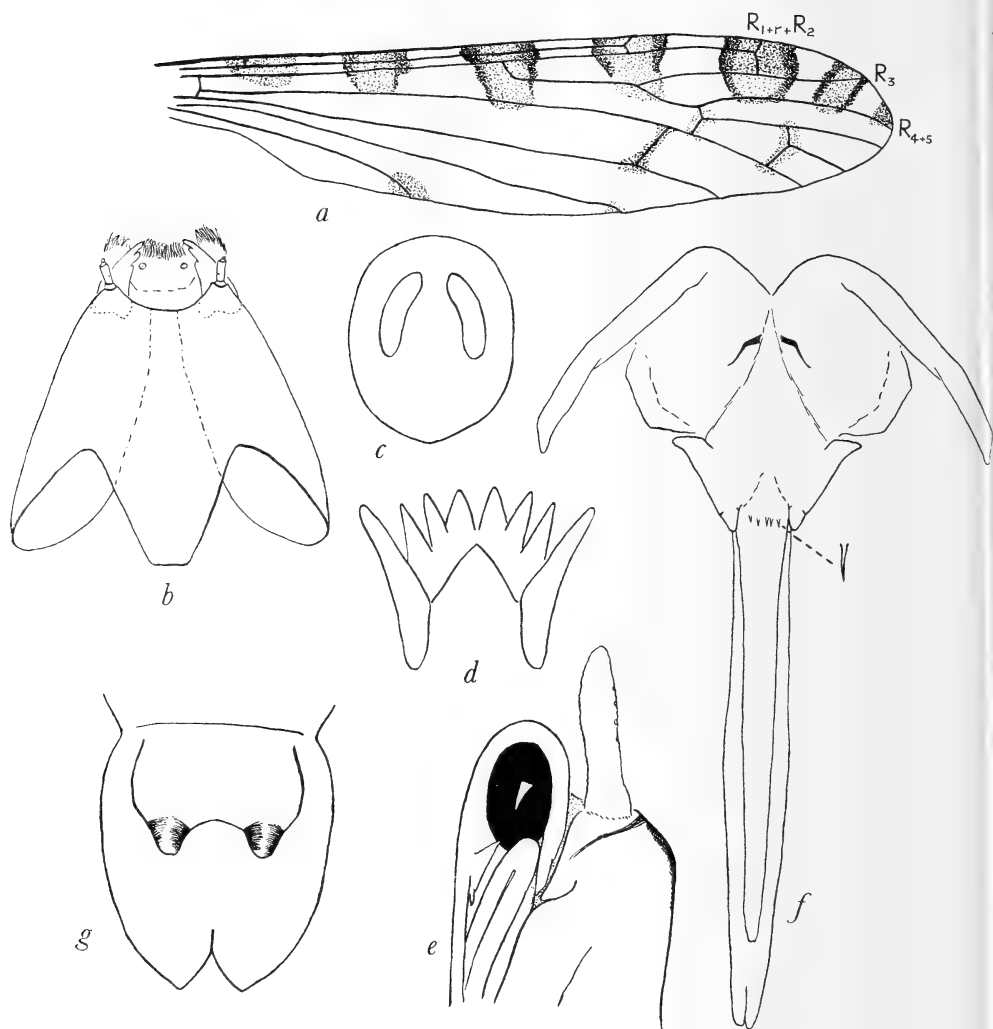


FIG. 59.—*Limonia sexocellata* (Alex.). Imago: a, wing. Larva: b, head capsule (dorsal view); c, spiracular disc; d, hypopharynx (dorsal plate and hinge plates). Pupa: e, anterior portion; f, head region (ventral view); g, male cauda (dorsal aspect).

Remarks.—Larvae and pupae collected at Platteklip (December 1933) by Mrs. Wood and the author occurred within jelly tubes

besprinkled with minute sand grains and were attached to the pendulous filaments of moss plants in the midst of a trickle of water. Judging from the enlarged salivary glands of the larvae, these tubes are composed of glutinous saliva. The locale of the adult fly is no indication of the environs of the immatures, for the former may be found resting in *Anopheles* fashion with the wings folded along the body under overhanging rocks and grottos or on the stems of trees as far as twenty yards from water. The characteristic "bobbing" of the flies when they first alight attracts the eye and renders them easy to capture. Associated with the above pupae were four pupae of *Limonia tipulipes*. This is not usual, for *tipulipes* immatures occur in jelly tubes on the surfaces of rocks in the stream-bed on which the moss growth is scanty and short. The larvae of *Limonia tipulipes* can be distinguished even in the field from those of this species by the conspicuous creeping welts; the *tipulipes* pupae differ in the shape of the breathing horns and in the possession of the prominent caudal spine.

Limonia rubrithorax (Alex.).

Fig. 60, a.

1921. pp. 186-187 (*Geranomyia*).

The wing venation was well described by Alexander and is figured here for the first time (fig. 60, a).

Localities.—Cape Peninsula: nil.

Cape Province: French Hoek Pass (East side) (K. H. B.), October 1933; Krom River (K. H. B.), September 1932; Witte River (K. H. B.), October 1931; Olifants River Mountains (K. H. B.), September 1932; Sneeuwgat (K. H. B., C. W. T.), November 1932; Tradouw Pass (North side, Barrydale) (K. H. B., C. W. T., H. G. W.), January 1935.

Larva.—Length 14-16 mm., diameter .8-1 mm. Closely allied to *Limonia sexocellata*. The creeping welts are not as heavily spined, and consequently not as conspicuous against the body colour. It differs from the larva of *sexocellata* by the number of teeth on the hypopharynx, the head capsule being identical with that of *Limonia tipulipes* (see fig. 51, b-g, i).

Pupa.—Length 9 mm., diameter .8-1 mm. Similar to that of *Limonia sexocellata*; no difference can be distinguished by the author.

Remarks.—The larva of this species can be distinguished readily from that of *tipulipes* by the spiracular arrangement.

Outside the village of Barrydale (January 1935) Dr. Barnard, Mr. Thorne and the author collected many larvae and pupae, which occurred in a feeble trickle of water some four to nine inches wide and were confined to the pendulous filaments of moss in the water. (See note on life-history of *Limonia sexocellata*.) Along the im-

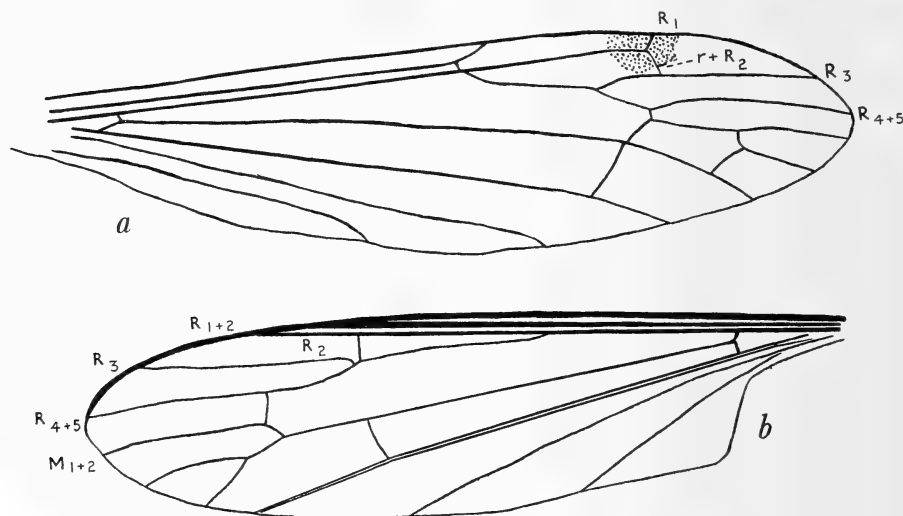


FIG. 60.—Wing of: *a*, *Limonia rubrithorax* (Alex.); *b*, *Antocha transvaalia* (Alex.).

mediate margins of the trickle of water were clumps of *Restio* one to two feet in height at the base of which were found the immatures of *Longurio dolichoros*.

Genus ANTOCHA, Osten-Sacken.

1859. p. 219.

Imago.—Rostrum short, not exceeding rest of head; wings with Sc very long, terminating near tip of R_{1+2} , *i.e.* about mid-length of basal section of R_5 , RS long, four times m-cu; R_2 perpendicular in position, inserted usually before tip of R_{1+2} by distance equal to twice its own length, the element R_{2+3+4} thus usually absent; vein R_{4+5} strikingly small, practically in alignment with RS, veins R_3 and R_{4+5} subparallel; cell R_3 scarcely divergent, r-m long, three-quarters the length of m-cu; cell M_1 absent; vein M_{1+2} swung

cephalad and not in the usual alignment with M; cell 1st M_2 open; cell M_3 widely divergent and short, twice the length of its petiole; Cu_1 inserted before fork of M by distance equal to twice its own length; anal angle of wing strikingly square and affording a distinctive generic characteristic. Male hypopygium with basistyles long, with two dististyles at apex, ventral dististyle not bulbous, but a flat, tapering chitinised blade.

This genus is represented in the S.W. Cape by a single species, the immatures of which are unknown.

Antocha transvaalia (Alex.).

Fig. 60, b.

1921. pp. 187–188 (*Orimargula*).

Alexander's description of the wing is correct.

Length 3.5 mm., wing 4.6 mm. General coloration reddish brown. Additional notes on the wing (fig. 60, b) are given in the generic characteristics.

Male hypopygium with ninth tergite small. Basistyles three times as long as broad; outer dististyle a flat, tapering chitinised blade; dorsal dististyle a fleshy pubescent lobe. Interbase thin, slender, bladelike, abruptly rounded apically, connected dorsally to basal inner margin of basistyle by a microscopically pubescent strip of chitin and ventrally to the smaller rodlike gonapophysis, ventrad of which is the slender prominently curved aedeagal sheath. Ninth sternite keel-shaped (lateral aspect), enclosing and protecting the slender penis.

Localities.—Cape Peninsula: nil.

Cape Province: Schoemans Poort (C. W. T., K. H. B., A. J. H.), November 1937.

Remarks.—The holotype locality for this fly was Komati Poort, Transvaal (Alexander, 1921, p. 188). In November 1937 Mr. Thorne collected several adults by torchlight along the edge of the stream in Schoemans Poort. In spite of a search in the following year by Mrs. Wood, Mr. Thorne and the author, no immature stages of this fly were found, although a clue to their habitat has been provided by Alexander (1931, p. 171) and Bangerter (1929, pp. 5–7), who record that *Antocha saxicola* of North America "lives within silken, mud-covered cases, fastened to the sides of submerged rocks in rapid-flowing streams." (See Addendum, p. 325).

Genus PSEUDOLIMNOPHILA Alex.

1919. p. 917.

1924. p. 4 (Key to Ethiopian species).

Imago.—Head strongly narrowed and prolonged behind; antennae 16-jointed; wings with Sc moderately long (terminating before fork of RS by distance equal to Sc_1) or long (terminating distad to the fork of RS), R_2 present, meeting R_1 just before wing margin by distance equal to its own length, thus R_{1+2} short; RS elongate, three and a half to four times m-cu; three branches of RS reach wing margin; cell R_3 very deep, parallel sided; cell M_1 present, deep, two and a half to three times its petiole (except *thornei*, where cell M_1 is one and a half times its petiole); anterior arculus lacking; pseudosutural foveae and tuberculate pits distinct; in male, hypopygium basistyles conspicuous bearing two dististyles at apex; ovipositor valves slender, chitinised.

Larva.—Creeping pads on abdominal segments 2-7; chaetotaxy not apparent; spiracular disc surrounded by five short lobes. Anal gills four, short, ovate. Head capsule massive, compact, of three plates. Antenna bi-segmented, apical segment hemispherical, with three to six minute papillae at base. Mandible massive, broad at base, tip produced to a slender point, cutting-edge with two teeth. Maxilla: outer lobe with apical palpus, inner lobe pubescent. Labrum broad, dorsal surface pubescent, with various sensory papillae. Hypopharynx a large flattened lobe covered with small subacute spines. Prementum a broad plate, minutely pubescent or as two pubescent lobes. Mentum chitinised, almost completely divided, outer face terminating in a single tooth, behind which is a tridentate plate.

Pupa.—Cephalic crest pronounced, with setiferous tubercles. Pronotal breathing horns slender, apices not split into flaps. Abdominal segments with subterminal transverse rows of spines and setae. Eighth segment of cauda with two spiracles and two setiferous tubercles on dorsal surface; venter with two chitinised lobes bearing numerous chitinised acute hooks; male cauda with biramous sternal sheaths.

The life-histories of the three species in the S.W. Cape area have been worked out by Mr. Thorne and the author. The immatures inhabit decaying logs near forest streamlets and are thus limited in their distribution.

Key to Species of *Pseudolimmophila*.

Imagos.

1. Sc ending before fork of RS; cell M_1 one and a half times its petiole; ventro-basal lobe on basistyles of male hypopygium present *thornei*.
- Sc ending beyond fork of RS; cell M_1 three to three and a half times its petiole; ventro-basal lobe absent 2.
2. Pleura with dark longitudinal stripe; wings (fig. 74, a) with dark brown clouds; RS relatively long, i.e. two and a half times the length of R_{2+3+4} ; ninth tergite of male hypopygium with deep median V *medialis*.
- Pleura unstriped; wings (fig. 74, b) unclouded; RS relatively short, i.e. one and a half times the length of R_{2+3+4} ; ninth tergite with wide median U *griseiceps*.

Larvae and pupae.—It is at present, due to the few specimens available for study, difficult to provide a key for the differentiation of the species, which are closely allied in appearance and structure.

Pseudolimmophila medialis (Alex.).

Figs. 61, a-d; 62-64.

1921. pp. 204-205 (*Limmophila*).

1924. p. 6 (in key) (*Pseudolimmophila*).

The holotype described by Alexander is a female.

♂: Length 7.5-7.8 mm., wing 7.8-8 mm. Head light brown, a long narrow diamond mark on vertex, apex of which is continued to end of the low tubercle (which is bifid in most females); long black setae comprise the cephalic chaetotaxy. Antennae slightly shorter than those of female, but similar in shape, six to seven times the length of head (rostrum excluded).

Pronotum light brownish yellow. Mesonotal praescutum warm brown, the two narrow darker brown stripes separated by a median vitta, half the width of a single stripe, this vitta continued caudally between the scutal lobes, the caudal and central areas of which are dark brown; lateral stripes of praescutum indistinct, dusky, concealing the ground colour along the lateral edges of the sclerite. Pleura light dirty yellow with a broad, dark brown, longitudinal stripe from the neck sclerites to the junction of the abdomen, dilated slightly beneath the wing; anterior spiracle encircled by a dusky fringe of this colour;

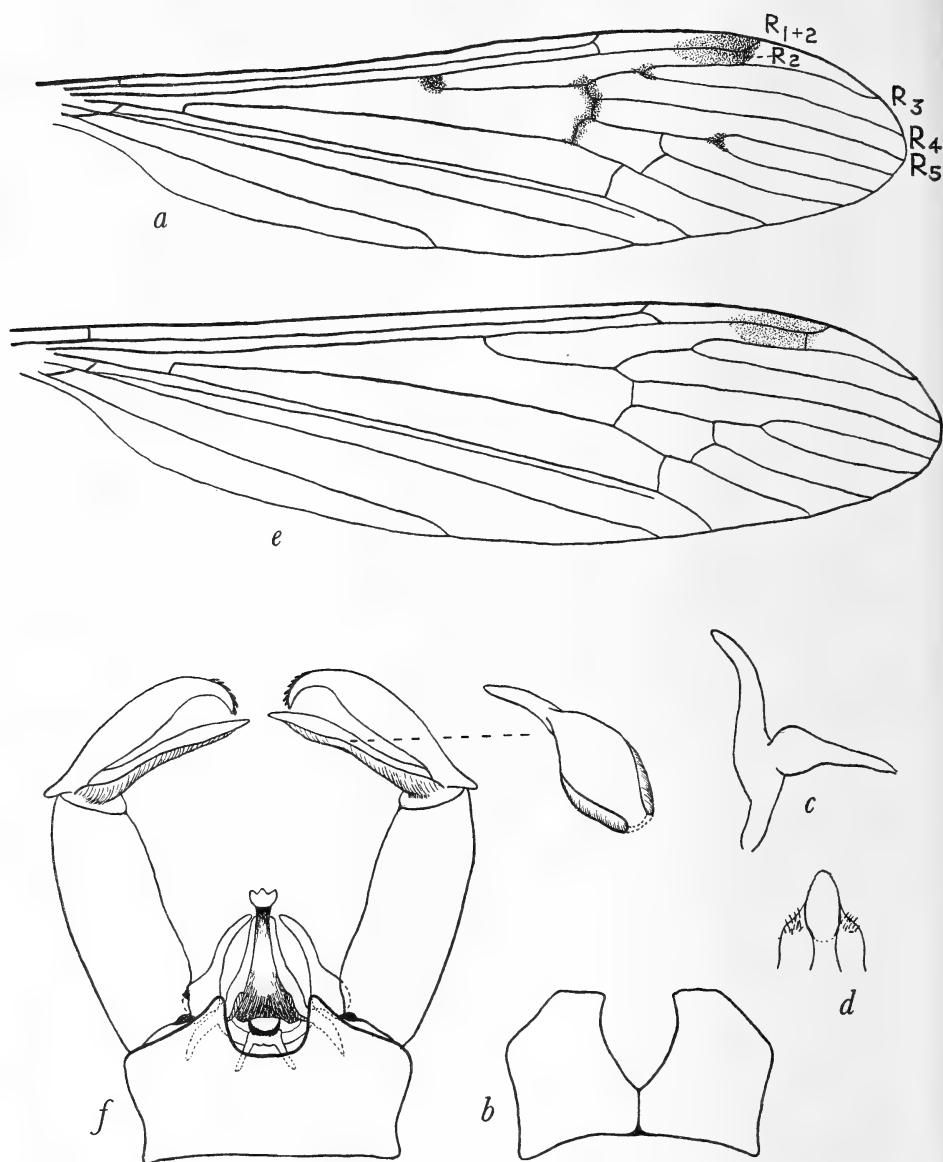


FIG. 61.—*Pseudolimnophila medialis* (Alex.). a, wing; b, ninth tergite (dorsal view); c, gonapophysis; d, tip of aedeagal sheath. *Pseudolimnophila griseiceps* (Alex.). e, wing; f, male hypopygium (dorsal view), inner dististyle enlarged.

(some specimens with the thoracic ground colour darker, so that the entire praescutum is dark brown with only the thin median vitta affording a lighter coloration for the sclerite). Legs dull yellow. Wings (fig. 61, *a*) with dark brown clouds as described by Alexander; RS two and a half times the length of petiole R_{2+3+4} , appearing relatively long; cell M_1 three times its petiole.

Male hypopygium as in male of *Pseudolimnophila griseiceps*, but revealing these differences: ninth tergite with a deep median **V** extending to near the cephalad margin of tergite, apices truncate (fig. 61, *b*). Gonapophyses undilated at base (fig. 61, *c*). Apex of aedeagal sheath (fig. 61, *d*) rounded; apices of lateral surfaces with numerous stiff microscopic hairs.

Localities.—Cape Peninsula: nil.

Cape Province: Oudebosch (K. H. B., C. W. T., H. G. W.), January 1935.

Larva.—Length 14–15 mm., diameter 1 mm. Colour rich golden-yellow, paler towards caudal segments; coloration due to the microscopic integumental pubescence on dorsal and ventral surfaces; head capsule blackish brown.

Body slender, terete, uniformly wide after the thoracic segments; ultimate segment swollen ventrally. Abdominal sternites 2–7 with transverse creeping pads situated anteriorly; opposite on tergites 2–5 a double transverse constriction, on tergites 6–7 a single constriction opposite caudal end of creeping pad; each posterior annulus thus formed with a single round mark on tergites and sternites 1–6, that on tergite 7 indistinct; a similar spiracle or mark on each pleurosternal margin of the thoracic segments. Chaetotaxy not apparent.

Spiracular disc (fig. 62, *e*) surrounded by five lobes, each blunt ventral lobe with a brown triangular spot on the face, each lateral lobe lined by a brown crescent, swollen ventrally, the single dorsal lobe lined by a dusky rectangular spot. Spiracles large, circular, separated by twice the diameter of a single spiracle, outer ring narrow, dark brown; inner portion black. Anal gills four, ovate, with a slight inner constriction near apex, anterior pair directed laterally.

Head capsule massive, compact, consisting of three plates; lateral plates curved, large, chitinised; apices membranous; dorsal plate triangular; apex caudad membranous. Antenna (fig. 62, *d*) bi-segmented, short-cylindrical, length of basal segment twice its diameter, auditory plate almost basal in position; apical segment subglobular or hemispherical, practically as wide as the basal segment, with three to six minute papillae at its base; junction of

antennae with head capsule partially surrounded by a dense ring of hairs. Mandible (fig. 62, *f*) massive, powerful, broad at base, a single

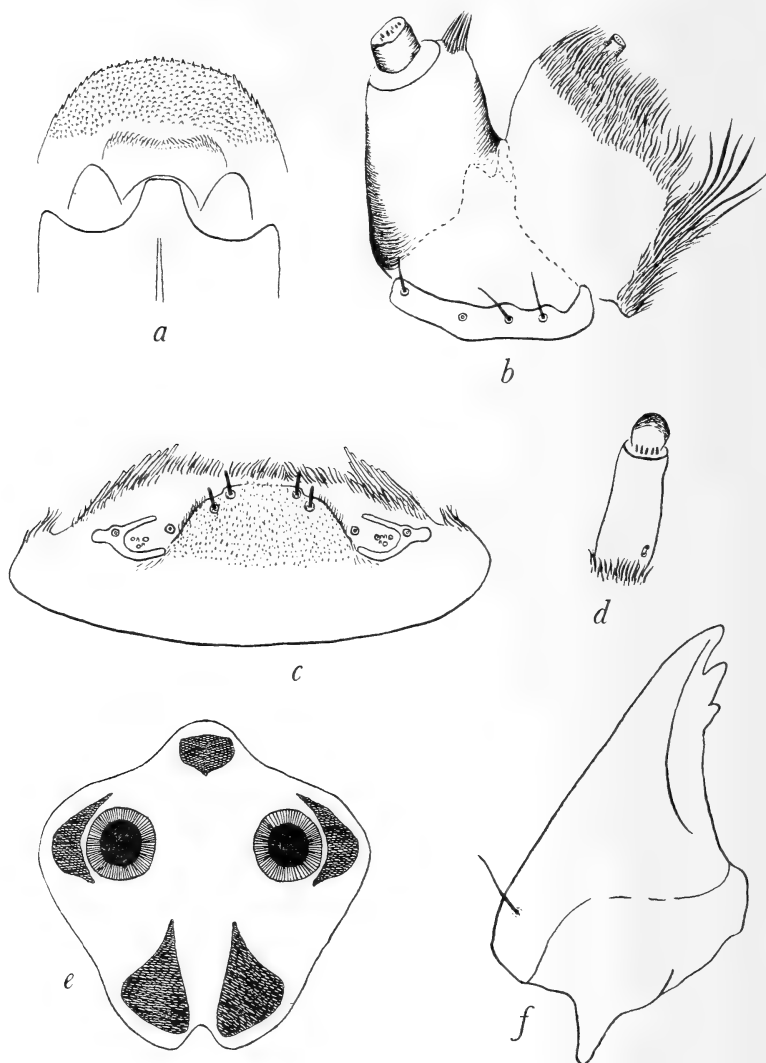


FIG. 62.—Larva of *Pseudolimmophila medialis* (Alex.). *a*, mentum, prementum and hypopharynx (ventral view); *b*, maxilla; *c*, labrum (dorsal view); *d*, antenna; *e*, spiracular disc; *f*, mandible.

seta at heel of mandible, tip produced to a slender point or tooth, dorsad of which is a single sharp tooth, ventral cutting-edge with

two stout teeth. Maxilla (fig. 62, *b*): cardo elongate, transverse, with four setiferous punctures; outer lobe with a tuft of setae at inner apical angle, palpus at its tip conspicuous, bearing six to eight minute papillae, inner lobe of maxilla densely pubescent apically, several elongate setae on inner margin, palpus on mesal apical region minute, bearing several microscopic papillae, the whole partially concealed by the pubescence of the lobe. Labrum (fig. 62, *c*) broad, short, dorsal surface densely pubescent, lateral margins of labrum with six to ten slender juxtaposed papillae, apices truncate, epipharyngeal surface with a flattened median lobe, minutely spinose or papillate, apex bluntly rounded, each outer apical angle of lobe with two slender sensory papillae, apices truncate; outer margins of lobe fringed with short hairs; on either side of the lobe's origin a chitinised horseshoe-shaped structure bearing a setiferous puncture, enclosing four to six minute papillae; between this horseshoe structure and the base of the lobe a setiferous puncture. Hypopharynx (fig. 62, *a*) a large flattened lobe, outer margin evenly rounded, surface densely set with small subacute spines or papillae. Prementum (fig. 62, *a*) a moderately broad plate, outer margin slightly concave, surface minutely pubescent. Mentum (fig. 62, *a*) heavily chitinised, almost completely divided, outer (ventral) face terminating in a single median truncate tooth, behind which is a tridentate plate, lateral teeth conical, median tooth smaller, evenly rounded.

Pupa (fig. 63, *a*).—Length ♂ 9 mm., ♀ 11 mm.; diameter 1.5–1.8 mm. Colour pale orange, eyes dusky brown, mature pupae darkened warm sepia; breathing horns blackened basally, apices dark reddish brown. Cephalic crest pronounced, a large setiferous tubercle on each of the antero- and the postero-lateral corners; a large cone at and connected to the origin of the antenna, conspicuous from a lateral aspect (fig. 63, *a*), not pronounced (ventral view) (fig. 63, *c*); antennae (fig. 63, *d*) moderately long, extending to base of wing pads; basal region swollen slightly, remainder slender. Labrum (fig. 63, *b*) evenly rounded; labial lobes indentate medially, each lobe evenly rounded. Maxillary palpi directed backwards, lying along margin of cheek, wide at origin, tapering to narrow apices. Frons with a seta laterad of the median line.

Thoracic pronotum convex, with a low median carina; a pair of setae ventrad to base of breathing horns, which are slender; apices directed ventrad; tracheal tube conspicuous. Lateral angle of thorax with a pair of setae. A single seta above wing axil; a seta above wing axilla and two setae on either side of median line comprise the

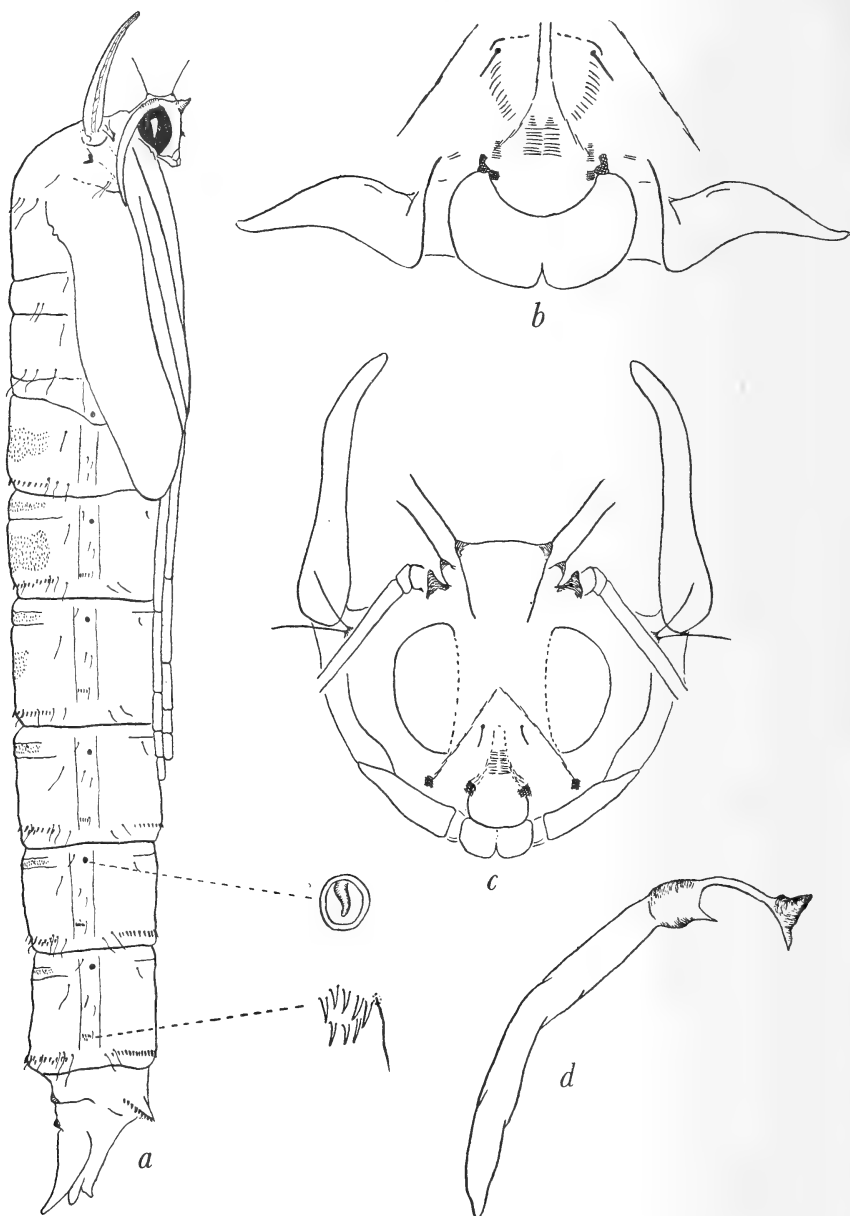


FIG. 63.—Pupa of *Pseudolimnophila medialis* (Alex.). a, lateral view; b, mouth parts; c, head (ventral view); d, antennal sheath.

mesonotal chaetotaxy. Leg sheaths end in male just beyond posterior margin of abdominal segment 5, in female opposite basal annulus of abdominal segment 5, apices of outer tarsi slightly longer than those of inner pairs. Wing pads end opposite posterior margin of abdominal segment 2, with the typical *Pseudolimnophila* venation in mature pupae.

Abdominal segments subdivided into two annuli, the dorsal basal annuli of segments 3-7 subdivided into two annulets; sternites 4-7 divided into a narrow basal annulus and a broad posterior annulus; lateral margins of abdominal segments carinate. Segment 1 (basal annulus): a seta on antero-lateral angle, pair of setae dorsad and mesad; (posterior annulus) a pair of similar anterior setae, a subterminal row of three setae. Dorsa of segments 2-7 (posterior annulus): subterminal transverse row of spines, intermingled with this row several delicate setae, a single seta at antero-lateral angle; venter of same annuli of segments 5-7 with similar rows of spines, fewer in number, laterad of this row on segments 5-7 and in a corresponding position on segments 3 and 4 two setae; venter of all posterior annuli with an anterior seta on either side of median line. Pleura (basal annuli) of segments 2-7 with a distinct spiracle, cephalad and dorsad of which is a delicate seta; (posterior annuli) with two mesal setae, caudad of which is a group of numerous spines and a single seta. Dorsal scabrous areas on the basal annuli of segments 3-7 and on posterior annuli of segments 2-4.

♂ and ♀ cauda (fig. 64): Dorsum of eighth segment constricted transversely, spiracles on basal annulus conspicuous, laterad and cephalad to each spiracle an elongate seta, caudad of which are three slender acute teeth; venter with two lateral chitinated lobes directed caudad and ventrad, separate in male but meeting in female, bearing a row of large, chitinated, acute hooks. Dorsum of posterior annulus with two large, conical setiferous tubercles, cephalad and laterad of which is a seta. Male cauda (fig. 64, c): tergal sheaths short, wide at origin, tapering to slender rounded dorsally directed apices, bearing two setae; sternal sheaths biramous; intermediate between tergal and sternal sheaths a median lobe, indentate medially. Female cauda (fig. 64, a, b): tergal sheaths wide at origin, tapering gradually to slender apices, two setae on outer apical surface; sternal sheaths not as prominent, conical, each sheath with a large lateral lobe directed ventrad and caudad.

Remarks.—Hart (1898, pp. 202-204) and Alexander (1920a, pp. 851-852) recorded that the immatures of the North American *Pseudolimnophila luteipennis* and *P. inornata* were characteristic swamp

inhabitants, frequenting rich organic mud. The three S.W. Cape *Pseudolimnophila* bred by Mr. Thorne and the author occurred in rotting logs in forest areas.

"Oudebosch" is the remains of a large indigenous forest which once skirted the foot of the River Zonder End Range on the southern escarpment side. Fire due to the promiscuous veld-burning by the surrounding farmers or to the careless "smoking out" of wild bees' nests by coloured folk, and the systematic cutting of the principal

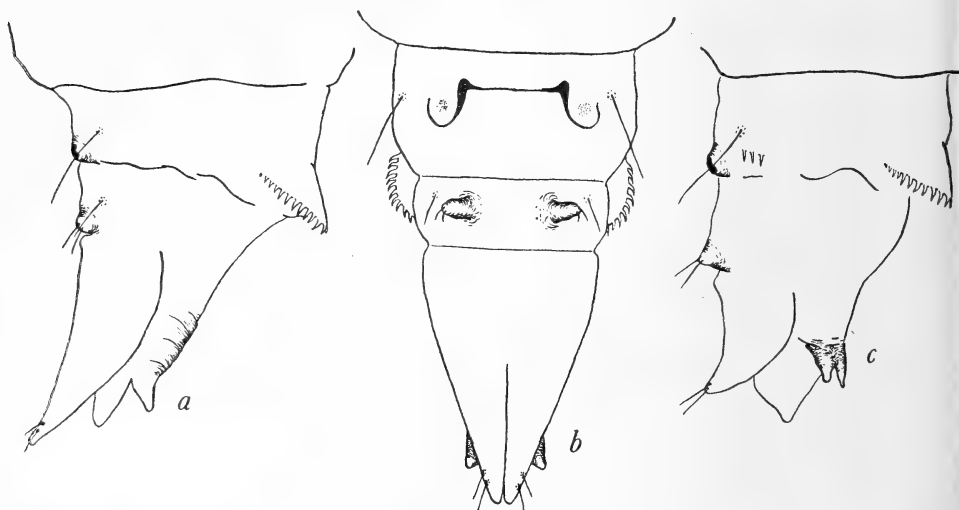


FIG. 64.—Pupa of *Pseudolimnophila medialis* (Alex.). a, female cauda (lateral view); b, dorsal view; c, male cauda (lateral view).

trees, have taken their toll. Oudebosch, however, is still a paradise for the collector of Tipulidae, offering several different types of habitat within a small area—treeless *Restio* ridges, shallow purling mountain streams with sandy margins, mossy boles of trees, decaying logs and forest-clearings with a carpet of rotting leaves.

Several decaying logs in the immediate vicinity of a small stream yielded the immatures of this species (January 1935). On the underside of one decaying log resting just above the splashing stream were found several newly emerged adults of *Pseudolimnophila medialis* and numerous pupal exuviae; the latter with the anterior portion from the end of the tarsal sheaths projecting. From a similar log larvae were reared, these occurred to a depth of three inches, being confined to the softer saturated portions of the log. The type of tunnel eaten by the larvae and the mode of emergence of the adults as in *Limnophilomyia lacteitarus*.

Pseudolimnophila griseiceps (Alex.).

Fig. 61, e, f.

1921. p. 206 (*Limnophila*).

1924. p. 7 (in key) (*Pseudolimnophila*).

The holotype described by Alexander is a female.

♂: Length 8.5 mm., wing 10.5 mm. Head dark grey to black, slightly paler than the eyes. Antennae similar to those of *P. medialis* Alex. in shape and length, *i.e.* six times the length of head (rostrum excluded), 16-jointed.

Pronotum lightish yellow, similar in colour to the pleura; longitudinal stripe of latter absent. Mesonotal praescutum light yellowish brown with deep reddish-brown stripe split by a capillary median vitta; lateral stripes arising from the posterior margin of the sclerite, not extending to lateral edges, which reveal consequently the ground colour; lateral stripes almost confluent with median stripe, separation barely perceptible. Scutal lobes reddish brown; pleura light yellow; longitudinal stripe absent. Wings (fig. 61, e) unclouded (see Alexander, 1921, p. 206); RS one and a half times the length of petiole R_{2+3+4} , appearing relatively short; cell M_1 three to three and a half times its petiole.

Tergites of abdomen pale brown; sternites dirty yellow. Hypopygium (fig. 61, f) with ninth tergite having a wide median U, apices subacute. Basistyles short, stout; outer dististyle pubescent, broad (lateral aspect), ventral margin prolonged into a chitinated sickle-shaped hook, bearing several stout acute spines; inner dististyle a fleshy lobe whose outer surface is concave, forming a shallow groove into which fits the outer dististyle when at rest. Basal inner margins of basistyle connected to dilation of the gonapophyses which are produced into slender lobes. Aedeagus partially surrounding penis, chitinated, with the usual "latera" for the attachment of muscles; apex of sheath trilobed on ventral margin.

Localities.—Cape Peninsula: nil.

Cape Province: Oudebosch (K. H. B., C. W. T., H. G. W.), January 1935; (C. W. T., H. G. W.) September 1937; Harkerville (G. A. W., H. G. W.), January 1938.

Remarks.—Mrs. Wood, Mr. Thorne and the author collected larvae and pupae of this species from a barkless decaying log of *Halleria*

capensis in Oudebosch forest-clearing (January 1937). The log rested on the leaf-bedecked ground some sixty yards from the nearest stream. The larvae occurred at varying depths, being as far down as one and a quarter inches.

Pseudolimnophila thornei sp.n.

Fig. 65.

♂: Length 7.5 mm., wing 9 mm.; ♀ 8.5 mm., wing 9 mm. Head, rostrum and antennae dull yellowish brown. Antennae three to four times the length of head (rostrum excluded), flagellar joints oval. Thorax dull yellowish brown with three slightly darker brown prae-scutal stripes; scutal lobes dark brown; postnotum blackish brown. Pleura yellowish brown with dark brown longitudinal stripe extending from the cervical sclerites to base of abdomen. Halteres light brown, knobs darker. Coxae and trochanters yellowish brown, remaining joints dark brown. Wings (fig. 65, *a*) suffused with black, with definite blackish-brown spots and clouds. Sc ends before fork of RS by a distance equal to basal deflection of R_{4+5} ; Sc_1 twice Sc_2 ; RS two and a half times the length of petiole R_{2+3+4} , appearing relatively long; R_2 joining R_1 before the tip by its own distance, inserted at mid-length of R; cell M_1 one and a half its petiole; anterior arculus lacking.

Abdominal tergites dark brown, sternites dull testaceous yellow; hypopygium (fig. 65, *b*) dark brown. Ninth tergite large, concealing the aedeagus, caudal margin undulating, with median **V**, apices subacute. Basistyles stout, a membranous area on dorsal surface, ventro-basal lobe slender, prominent. Outer dististyle pubescent, broad, dilated mesally, apex sharply bent into a short, spineless, sickle-shaped hook; inner dististyle pubescent, forming a shallow groove into which fits the outer dististyle. Basal inner margin of basistyle connected to the gonapophysis by strip of chitinised tissue; gonapophyses semicircular, attached to aedeagus, curving dorsad and fusing with the membranous region of the aedeagus. Aedeagus (fig. 65, *c*, *d*) consisting of two slender chitinised rods lying close to the penis, easily separated under slight pressure of a needle point, latero-basal projections of aedeagus prominent. Penis (fig. 65, *c*) chitinised, slightly bulbous basally, tubelike, apex truncate.

Localities.—Cape Peninsula: Fernwood (C. W. T.), April 1936.

Remarks.—The adult flies are separated easily from the two S.W. Cape species: *P. griseiceps* and *P. medialis* by the venation and wing markings, the shape of the ninth tergite and the presence of a ventro-basal lobe on the basistyles.

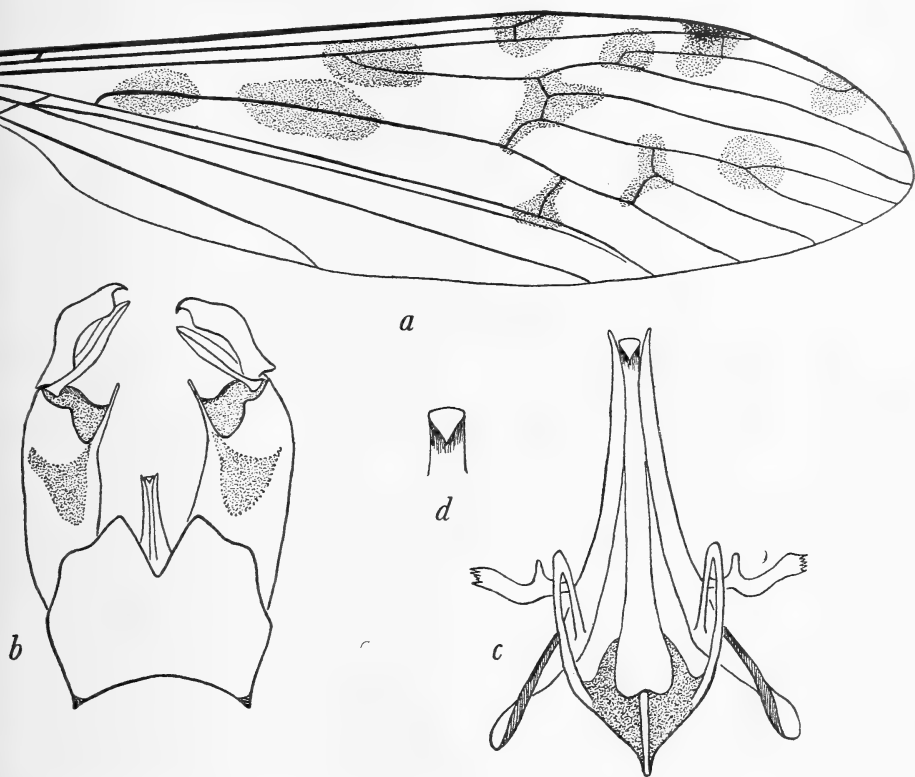


FIG. 65.—*Pseudolimnophila thornei* sp.n. a, wing; b, male hypopygium (dorsal view); c, penis and aedeagal sheath; d, tip of aedeagal sheath enlarged.

Adult flies of this species were bred by Mr. Thorne from larvae collected at Fernwood Ravine (March 1936). They were in a saturated rotting log of *Cunonia capensis*, which lay over the shallow streamlet.

Genus LIMNOPHILOMYIA Alex.

1921. *Limnophila* subgen. *Limnophilomyia*, p. 208.

Genotype: *Limnophilomyia lacteitarsus* Alex.
(Southern Ethiopian region).

Imago.—Rostrum short, not exceeding rest of head, labium triangular, pointed; male antennae elongate, twice the length of combined head and thorax; female antennae equal in length to combined head and thorax, 16-jointed, flagellar joints with short sub-basal verticils; tibial spurs absent; wings with Sc long, terminating at fork of RS, Sc₂ equal in length to Sc₁; tip of R₁ frequently indistinct, R₂ lacking, cell R₂ deep and gradually divergent, longer than its petiole; RS long, four times m-cu; vein R₅ in a straight line with RS; 1st M₂ cell small, almost square; cell M₁ lacking; male hypopygium simple, basistyles elongate, slender, each bearing apically a single elongate dististyle one-half its length; aedeagus a slender tube surrounding the elongate slender penis; female ovipositor with acicular chitinised valves.

Larva.—Body elongate, slender, thoracic segments the most prominent, conspicuous dorsal and ventral pedal warts on abdominal segments 2-7. Spiracular disc a minute dorsal projection at apex of abdomen, lobes absent, spiracles narrow, slitlike. Head capsule massive, compact, of one dorsal and two lateral plates; antennae unsegmented, cylindrical, with an apical papilla; mandible powerful, short, stout, apical surface bearing a ring of five teeth; maxilla with outer lobe having an apical palpus, inner lobe equal in length, its pubescence forming a brush of setalike hairs; labrum broad, entire surface covered with setalike hairs; hypopharynx a broad flat collar, anterior margin with six to eight stout teeth; mentum a chitinised plate, anterior margin with five stout teeth. Anal gills four, conspicuous, with tracheae.

Pupa.—Cephalic crest small, a transverse ridge. Pronotal breathing horns thin, flattened, tapering blades. Abdominal segments devoid of spinal armature but having short setae; a basal transverse scurfy welt on abdominal segments 3-6. Eighth segment of cauda with two dorsal rounded setiferous lobes, male cauda with tergal and sternal sheaths of equal length, former tapering to dorsally curved spines; tergal sheaths of female cauda the longer and more chitinised.

This genus contains the single species formerly placed in a subgenus *Limnophilomyia* Alex. of the genus *Limnophila* Macquart. The absence of tibial spurs in the imago, the primitive organisation of the immature forms and their intimate relationship with those of the

lower subtribes of the tribe *Hexatomini* render it impossible for the inclusion of this fly in the genus *Limnophila*. It is necessary, consequently, to raise the subgenus *Limnophilomyia* of Alexander (1921, pp. 208–209) to generic rank.

Limnophilomyia lacteitarsus Alex.

Figs. 66–68.

1921. pp. 209–210 *Limnophila* (*Limnophilomyia*).

Additional notes as follows:—

♂: Length 7 mm., wing 7.7 mm. Entire head with a pubescence of black hairs.

Alexander's description of the male antennae is excellent: scapal joint 2 is globular; terminal flagellar joint minute (fig. 66, *f*), subpiriform. Pseudosutural foveae light yellow. Each side of thorax with following chaetotaxy (fig. 66, *b*): pronotum two setae; mesonotal praescutum with row of twelve to thirteen setae on lateral surface; scutum two setae near caudal margin; scutellum twelve to twenty delicate setae, covering entire sclerite; junction of mesepisternum and mesosternum with a horizontal row of four setae; mesal region of mesepisternum with a vertical row of five to six setae; caudad of origin of latter a row of four to six setae. Halteres elongate, ending in white fleshy knobs (not black). All legs similar to the posterior leg described by Alexander; claws black. Tibial spurs absent.

Wings (fig. 66, *a*): As in Alexander. Numerous specimens from the following list of localities show: Sc_1 and Sc_2 at tip of Sc , equal in length, ending opposite fork of RS (Sc_2 does not project "considerably beyond Sc_1 " and is not "nearly four times the length of Sc_1 alone"). In this respect the holotype is abnormal. A single male had M_1 and M_3 joined just before the wing margin (with cell 1st M_2 consequently closed) and the tip of R_1 distinct, reaching wing margin.

Abdomen dark brown, rather long. Alexander writes: "Hypopygium rather small, the pleurites moderately stout, elongate, the long, slender, yellow pleural appendages lie on the dorsal face of the pleurites, and are subsinuous with the tips bent slightly outward." Ninth tergite and sternite fused, latter incomplete with a resultant gap ventrad to origin of penis, ventral edges produced slightly; caudal margin of tergite produced into two conspicuous pubescent processes,

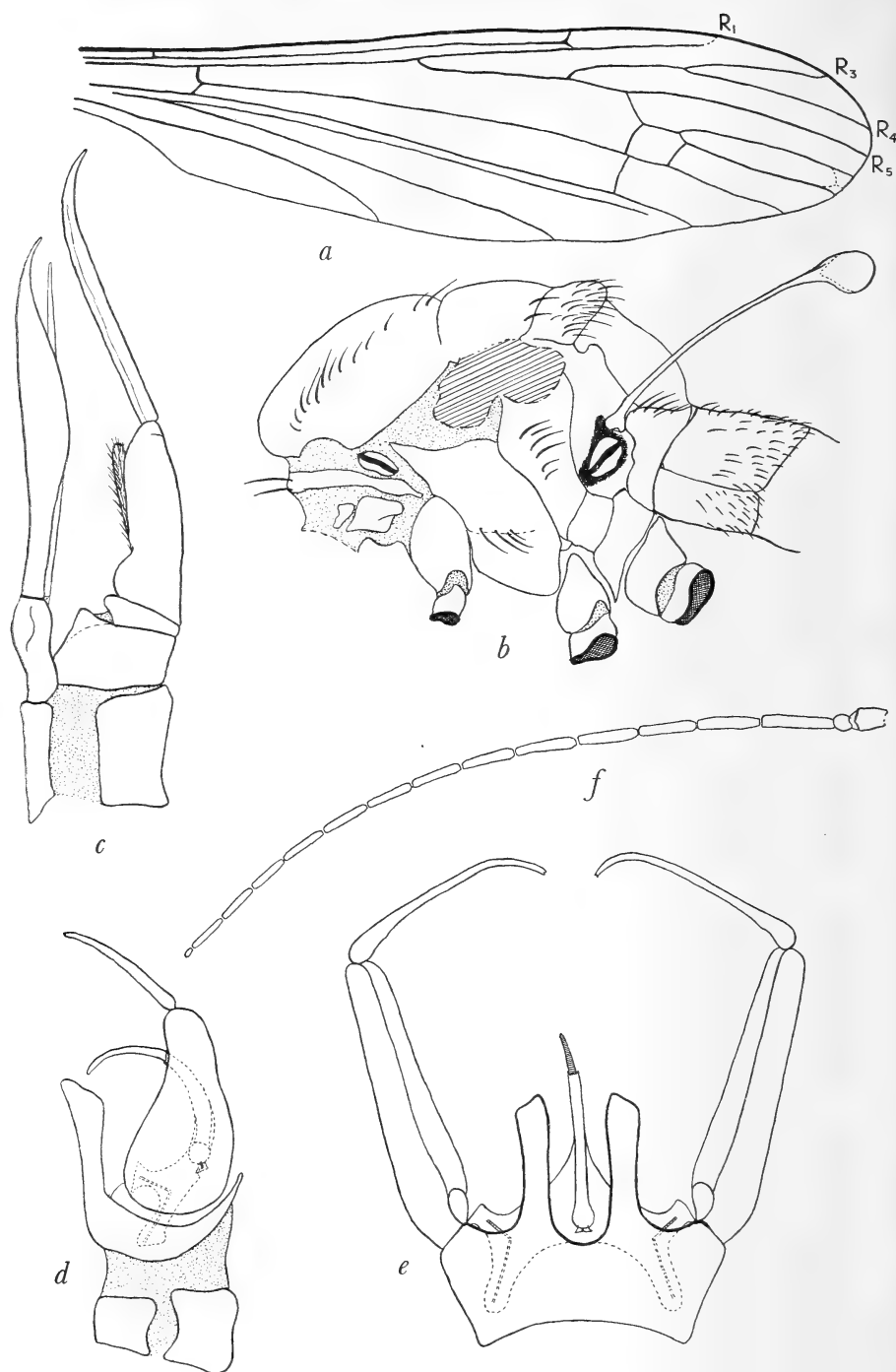


FIG. 66.—*Limnophilomyia lacteitarsus* Alex. a, wing; b, thorax (lateral view); c, ovipositor (lateral view); d, IXth tergite and male hypopygium (lateral view); e, dorsal view of same; f, male antenna.

almost one-half the length of the basistyles, tips truncate (fig. 66, *d, e*), apical outer margin twisted ventrally. Basistyles uniformly narrow (dorsal aspect), base bulbous, tapering to a stout, bluntly rounded apex (lateral aspect); dististyle (as in Alexander) sparsely haired. Aedeagus simple, merely a sheath surrounding penis; lateral basal surface giving rise to a bladelike projection, directed cephalad, and to a short gonapophysis, dorsally directed, connected to inner base of the basistyle. Penis elongate, curved dorsally, bulbous base rounded with a triangular basal blade (fig. 66, *d*).

Female similar to male in colour, chaetotaxy and venation. Antennae a miniature of that of male, slightly less than the length of the combined head and thorax, similar in shape and pubescence.

Abdomen with ninth tergite reduced, a narrow ring surrounding most of the tenth tergite; latter hairy, uniformly wide (dorsal view), supporting the slender, acicular, slightly curved tergal valves, and ventrally giving rise to two fleshy hairy lobes; eighth sternite supporting apically the carinate, chitinised sternal valves, mesal portion of each being split and giving rise to an extra acicular valvelet (fig. 66, *c*).

Localities.—Cape Peninsula: Oudekraal Ravine (G. A. W., H. G. W.), August 1933; Window Gorge (K. H. B., H. G. W.), November 1932; Platteklip (K. H. B., H. G. W.), November 1933.

Cape Province: French Hoek Pass (H. G. W.), December 1934; (East side) (K. H. B.) October 1933; Landdrost (K. H. B., C. W. T., H. G. W.), January 1933; Steenbras (K. H. B., C. W. T., H. G. W.), November 1932; Oudebosch (C. W. T., H. G. W.), January 1933 and 1934; (H. G. W.) September 1937; Bains Kloof (East side) (K. H. B., H. G. W.), May 1933; du Toits Kloof road (G. A. W., C. W. T., H. G. W.), September 1933; Seven Weeks Poort (H. G. W.), January 1935; Palmiet River (G. A. W., H. G. W.), January 1937.

Larva.—Length 19–20 mm. Coloration of thoracic segments golden-yellow due to the short pubescence; abdominal segments to segment 6 dark brownish black due to contents of alimentary system; remainder of abdomen frequently devoid of food, consequent coloration of this region pale white; integument transparent; apex of spiracular disc and the tracheal tubes caudad of the anal gills a light brown.

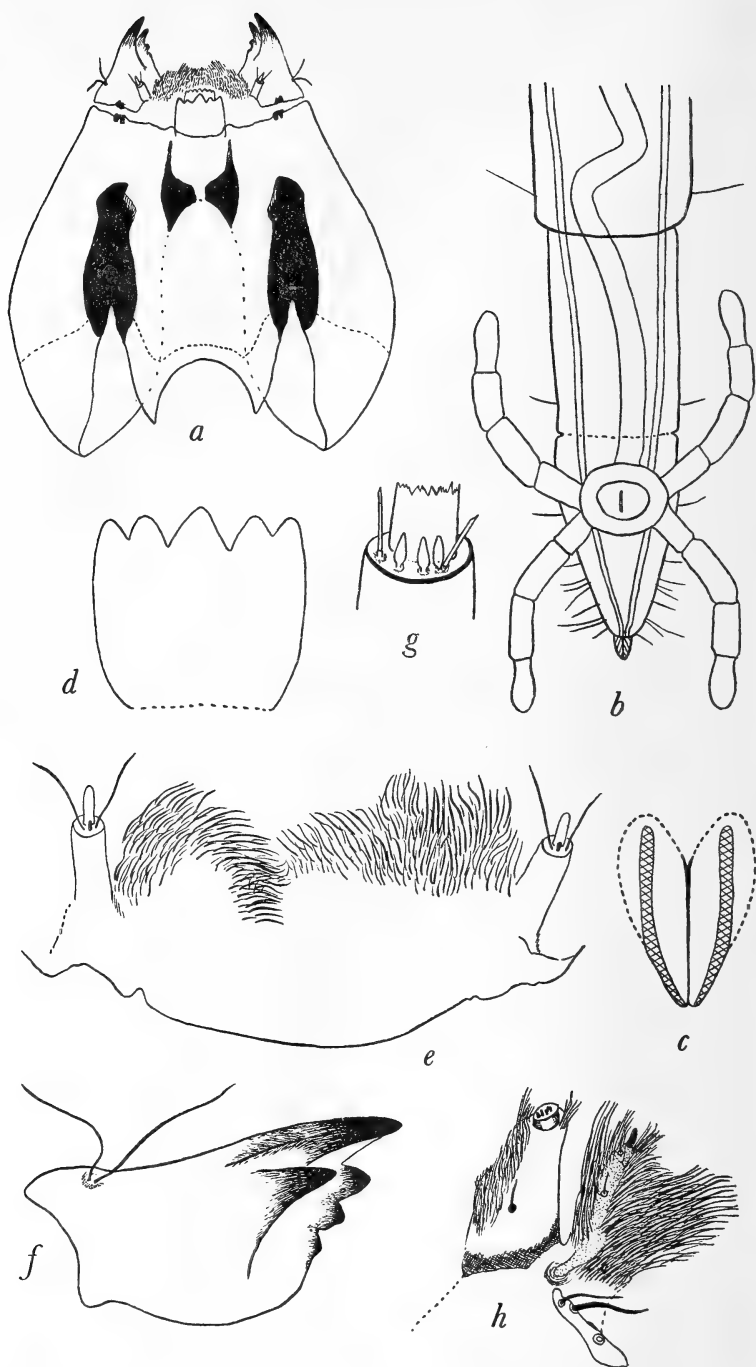


FIG. 67.—Larva of *Limnophilomyia lacteitarsus* Alex. a, head capsule (dorsal view) showing underlying mentum and hypopharynx; b, end of abdomen (ventral view) with anal gills and anus; c, slitlike spiracles; d, mentum; e, labrum and antennae; f, mandible; g, antennal papillae; h, maxilla.

Body elongate, terete, slender, thoracic segments the most prominent, prothoracic segment divided into two rings by a faint constriction; pleural regions of the posterior ring, the dorsum and the venter of the mesothoracic and the venter of the metathoracic segment produced; conspicuous dorsal and ventral pedal warts on abdominal segments 2-6, each about one-half the diameter of the particular segment, situated anteriorly on segments 2-4, but nearer the mesal regions on segments 5-6, the dorsal warts anterior to the level of the ventral, each with numerous rows of microscopic hooks fringed by stiff short setae; first abdominal segment short; second and third each twice the length of first segment; fourth-seventh gradually becoming longer, actual segmentation of the latter indistinct; a slight constriction immediately cephalad of the anus.

Chaetotaxy: anterior ring of prothoracic segment two setae on meso-lateral surface, posterior ring with two pleural setae, dorsad and ventrad a single anterior seta; meso- and metathoracic segments five scattered setae and two ventral setae, one anterior and one posterior. Abdominal segment 1 with four evenly spaced pleural setae, two setae on each side of dorsum near posterior margin; segments 2-3 with one pleural seta on a level with pedal wart, three pleural setae two-thirds from anterior margin and three pleural setae near posterior margin; segment 4 with arrangement as in previous segment except for a single posterior seta; segments 5-7 as in segment 4.

Spiracular disc (fig. 67, *b, c*) a minute dorsal projection at the apex of the abdomen, lobes absent, spiracles parallel to one another, narrow, slitlike. Anal gills (fig. 67, *b*) four, conspicuous, each gill constricted transversely into four apparent segments; tracheae visible.

Head capsule (fig. 67, *a*) massive, compact, consisting of three plates, the lateral plates curved, large, chitinised along their junction to dorsal plate, apical portion of each plate membranous; ventral origin of each plate with a rounded chitinised area (ventral aspect); dorsal plate short, with a wide median **U**, apices membranous, acute. Antennae (fig. 67, *e, g*) unsegmented, cylindrical, about one-quarter the length of the mandible, apex with a large conical papilla, at base of which occur three minute sensory pegs and two elongate setae. Mandible (fig. 67, *f*) short, stout, massive, outer basal surface with two setae, apical surface bearing a ring of five teeth, the second tooth the largest, the first tooth frequently split into two slender teeth, the remaining teeth becoming abruptly smaller. Maxilla (fig. 67, *h*): cardo long and narrow, subtransverse, with three conspicuous setae; outer lobe pubescent along outer margin, palpus

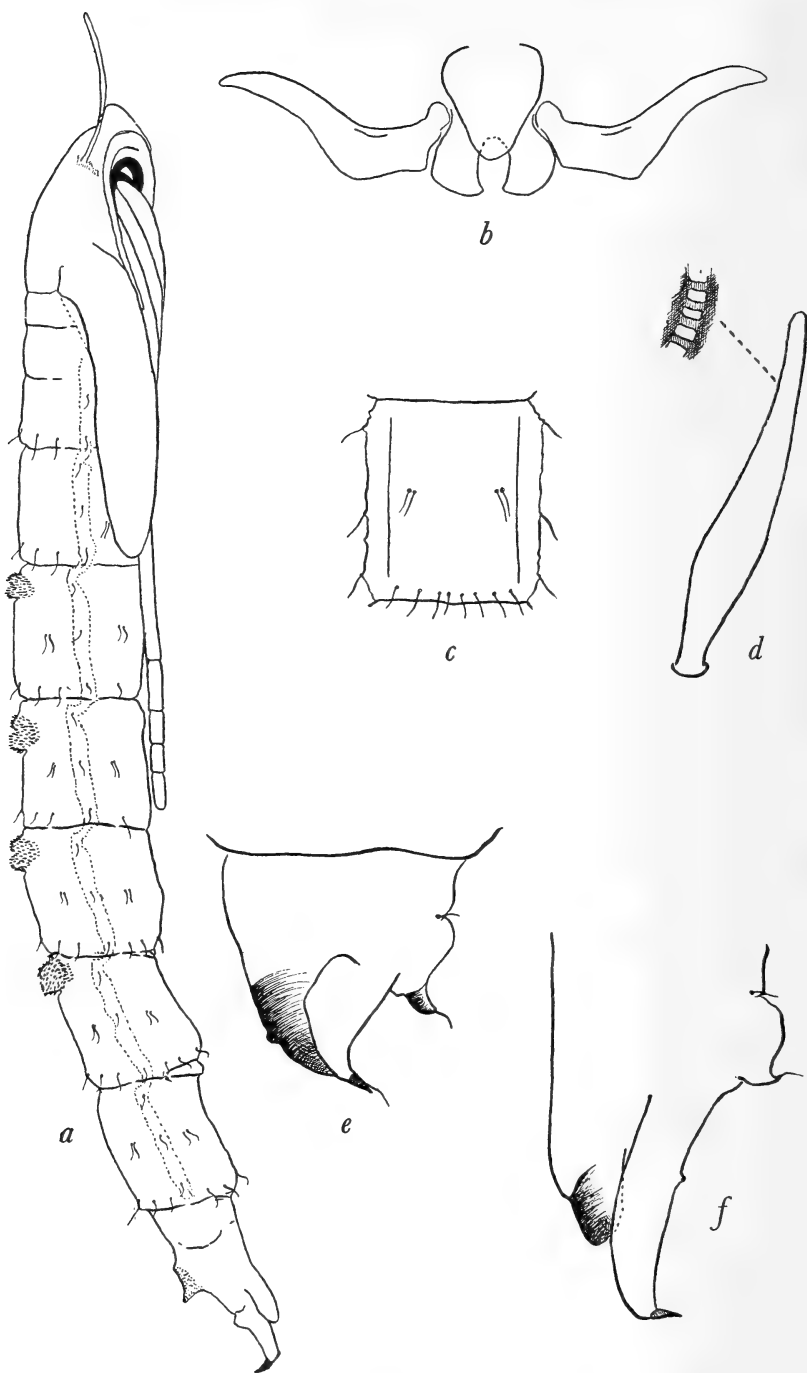


FIG. 68.—Pupa of *Limnophilomyia lacteitarus* Alex. *a*, side view of pupa; *b*, mouth parts; *c*, fifth abdominal segment (ventral view); *d*, breathing horn, with further enlargement of marginal striae; *e*, male cauda (lateral view); *f*, female cauda (lateral view.).

short, flattened, disc-like, partially surrounded by a tuft of moderately long setae and having several conical sensory pegs at its apex; inner lobe equal in length although much more slender than outer lobe, with one mesal and one apical seta, apex with a conical papilla, pubescence of lobe forming a thick brush of long setalike hairs. Labrum (fig. 67, *e*) broad, entire surface covered with setalike hairs. Hypopharynx (fig. 67, *a*) a broad flat collar, anterior margin with six to eight stout blunt teeth; lateral edges of collar produced ventrally, bearing a few short hairs. Mentum (fig. 67, *a*, *d*) a broad, heavily chitinated plate, anterior margin with five blunt, stout teeth, middle tooth the largest.

Pupa (fig. 68, *a*): Length 12 mm., diameter 1.4–1.6 mm. Newly formed pupae pure white with slight chitination on head and cauda; older pupae yellowish cream; mature pupae with wing pads and legs up to ends of tibiae black.

Cephalic crest small, a low transverse median ridge. Labrum (fig. 68, *b*) broad, tapering to bluntly rounded apex; labial lobes rounded apically, inner lateral corner pointed. Maxillary palpi long, tapering to slender apices. Antenna (fig. 68, *a*) of female short, extending to one-quarter the length of wing pad; male longer, extending to three-quarters length of wing pad.

Thorax flattened somewhat dorso-ventrally. Pronotal breathing horns (fig. 68, *a*, *d*) thin, slender, curved dorsad (lateral aspect); narrow at origin, swollen mesally into a flat tapering blade, the margins having horizontal chitinated striae (dorsal aspect). Dorsad of the base of each breathing horn a small tubercle bearing two short setae. Wing pads end opposite posterior margin of abdominal segment 2; leg sheaths opposite end of segment 4, ends of tarsi forming blunt **V**, the innermost tarsi the largest.

Abdominal segments slightly flattened dorso-ventrally, the pleural regions slightly carinate. Entire segments densely covered with acute microscopic spines; abdominal tergites 3–6 having a prominent basal transverse welt with stout, acute chitinated spines. Chaetotaxy: abdominal tergites 1–7 and sternites 5–7 with a transverse row of eight evenly spaced setae near posterior margin, tergites 3–7 and sternites 5–7 with an additional pair of setae on each meso-lateral region (fig. 68, *c*); sternites 3–4 with three setae on either side of leg sheaths, a mesal pair and a single posterior seta; laterad and cephalad of wing-pad's apex on segment 2 a pair of setae; pleura 3–7 with three setae, one anterior, one mesal and one posterior.

♂ cauda (fig. 68, *e*): Sternal sheaths contiguous medially, bluntly

rounded, projecting between the divergent tergal sheaths, which are short, thick at origin, tapering to acute, dorsally curved, chitinated apices, on inner side of which is a short seta. In meso-dorsal region of tergal sheaths are two projecting rounded lobes, each bearing a short seta.

♀ cauda (fig. 68, f): Sternal sheaths short, bluntly rounded, connected to and concealed by the narrow tergal sheaths, which are larger, more chitinated, tapering to blunt apices, on each side of which is an acute, dorsally directed spine and three minute setae; meso-lateral lobes as in male.

Remarks.—The darkly coloured adults are easily recognisable by their characteristic “white feet.” They occur on the underside of logs in which the immatures live, the entire colony being extremely restricted in its distribution. In open, treeless, mountainous areas, such as in the Steenbras area, Hottentots-Holland Mountains, the adults are found among the reeds (*Restiaceae*), which overgrow and partially conceal the actual streamlet. The adults may be captured while one is worming a way on hands and knees through the reeds * —sweeping is of little avail. In these regions it is probable that the immatures inhabit the roots and rotting stems of the reeds.

Several larvae were collected at Window Gorge (July 1932) in a decaying log of Rooiels (*Cunonia capensis*) on the edge of a waterfall pool. The larvae were found one to one and a half inches above, but the majority occurred two to three inches below the water-level, this portion of the log being constantly in contact with the water of the pool. The surface of the log was soft, barkless and saturated. The larvae tunnel parallel to and just below the rotten surface, often to a depth of one and a half inches. Prior to pupation the larva eats its way to above the water-level and almost to the log's surface, being separated from the exterior by a layer of wood of infinitesimal thinness. Thus a tunnel is made, wider than the width of the future pupa. Pupation occurs near the exit covering; as a general rule the tips of the breathing horns are two to four millimetres below the exit. The larval skin is deposited in the tunnel. The pupa gradually darkens. After some six days it bursts through the thin exit covering, and the anterior portion from the middle of the tarsal sheaths projects backwards. By prolonged and sustained effort the imago emerges from the pupal case, which is left extruding from the old tunnel.

In Steenbras area (November 1932) two pupae and several pupal

* “Grouting” is the term used by entomologists in the Fenlands in England.
[Ed.]

exuviae were collected from a damp rotten log near a streamlet in a small group of trees. Three larvae were close by in another small log. These were bred. Adults emerged in December 1932. Duration of pupal stadium is six days (minimum). In this locality the larvae, pupae and pupal exuviae were on the underside of the logs, which were splashed from time to time by the streamlet.

In copula the female rests on the log with the wings folded lengthwise over the abdomen. The male hangs head downwards but with the wings similarly folded, the legs being spread out and free from any support.

Genus LIMNOPHILA Macquart.

1834. p. 95.

Imago.—Rostrum short, not exceeding rest of head; antennae 16-jointed; wings with Sc moderately long, terminating before fork of RS by distance equal to Sc_1 (except *venaguttula*, where Sc is long, terminating at fork of R_{2+3+4}); R_2 present, meeting R_1 just before wing margin by a distance equal to its own length, thus R_{1+2} short; RS elongate, four to five times m-cu; three branches of RS present; cell R_3 very deep; cell 1st M_2 present; cell M_1 present, equal to or less than its petiole in length (except *venaguttula*, where cell M_1 is one and a half its petiole); in male hypopygium basistyles short to elongate with two dististyles articulating apically; aedeagus a shallow simple cup surrounding penis; female ovipositor valves short and broad, not acicular.

Larva.—Body slender, terete. Spiracular disc surrounded by four lobes, inconspicuous or prominent, fringed with elongate hairs. Anal gills four, short. Head capsule very dissected. Mandible massive, tip produced to a slender point, cutting-edge with three to four teeth. Maxilla an elongate, flattened, projecting blade. Antenna one- or two-segmented; if latter, basal segment broad, second segment elongate, cylindrical with minute papillae at apex. Labrum broad, armed with various papillae and setae. Prementum reduced, inconspicuous; mentum heavily chitinated, consisting of two lateral rods and a transverse bar.

Pupa.—Cephalic crest reduced. Pronotal breathing horns short, usually cylindrical. Abdominal segments armed with acute or castellate spines, lateral margins often carinate. Tergal and sternal sheaths of cauda conspicuous, large; dorsum of eighth segment with square of four lobes, with a few setae or small spines nearby.

Three of the four species of *Limnophila* occurring in the S.W. Cape have been bred. The agile larvae are to be found in gravelly sandy spits and in organic saturated mud at the margin of shallow streamlets and rills.

Key to Species of *Limnophila*.

Imagos.

1. Wings unspotted or unclouded except for the stigma . . . 2.
 Wings with marked pattern of spots and blotches . . . 3.
2. Antenna with flagellar joints 1-3 subglobular, enlarged, becoming abruptly less broad and slightly shorter; tergal valves of ovipositor tapering to rounded apices, sternal valves with more than ten apical setae; male hypopygium with a pronounced ventro-basal lobe on each basistyle . . . *crepusculum*.
 Antenna with flagellar joints 1-4 subglobular, the first joint the largest, joints 2-4 gradually becoming less broad, about equal in length; tergal valves of ovipositor abruptly rounded apically, sternal valves with six to ten delicate apical setae; male hypopygium without a ventro-basal lobe on basistyle . . . *nox*.
3. Wings (fig. 69, *a*, *b*) with heavy pattern of spots which tend to merge together in apical portion of wing; cell M_1 small, equal to or less than length of its petiole, supernumerary cross-vein in cell M distad to origin of RS . . . *dubiosa*.
 Wings (fig. 77, *a*) with light pattern of spots which are clearly separate; cell M_1 longer than its petiole, supernumerary cross-vein in cell M at or proximad to origin of RS . . . *venaguttula*.

Larvae.

1. Four conspicuous lobes on spiracular disc (fig. 70, *f*); cutting-edge of mandible with four teeth (fig. 70, *a*); maxilla long, slender, outer lobe pronounced, apex hyaline . . . *dubiosa*.
 Four inconspicuous spiracular lobes (fig. 74, *f*); cutting-edge of mandible with three teeth (fig. 74, *b*); maxilla a long, flattened, projecting blade . . . 2.
2. Body colour a dark golden-yellow due to the long luxuriant pubescence of the integument . . . *crepusculum*.
 General coloration white or cream, pubescence scanty, more pronounced towards caudal segments but never prominent . . . *nox*.

Pupae.

1. Abdominal segments flattened dorso-ventrally, lateral margins incised, the carinate margins consequently being pronounced flattened blades (fig. 71, *e*); abdominal armature of mam-miliform spines (fig. 71, *a*, *c*) . . . *dubiosa*.

- Abdominal segments normal, not flattened dorso-ventrally,
lateral margin not carinate (fig. 75, e) 2.
2. Pronotal breathing horns tapering. Mesonotal ridges sharp,
spinose (figs. 75, e; 76, a). Abdominal armature of simple
spines (fig. 75, f) *crepusculum*.
- Pronotal breathing horns not tapering. Mesonotal ridges low,
crenulate (figs. 76, b, c). Abdominal armature of castellate
spines (fig. 76, f) *nox*.

Limnophila dubiosa Alex.

Figs. 69–71.

1917. pp. 156–157 (? *Limnophila*).

Alexander's description of the antennae of the holotype male is sound. Since "but six flagellar segments remain," additional notes are as follows: antennae of male slightly more than twice the length of that of the *major* female; 16-jointed, flagellar joints 7–12 uniform, cylindrical, gradually becoming shorter; penultimate joint slightly shorter than previous joint, apical portion dilated; ultimate joint one-half the penultimate in length, of similar shape, apex with three to six short, stout setae (fig. 69, c).

Male hypopygium with ninth tergite and sternite fused to form a uniformly wide segment, the caudal margin of former with a pronounced median indentation (fig. 69, g). Basistyles elongate, slender, with a microscopic pubescence and numerous large scattered setae. Outer dististyle a flattened chitinised blade, narrow at its origin, apical margin square, outer apical surface with a single row of small black spines, directed apically, ultimate spine more pronounced, acute; inner dististyle a fleshy lobe with scattered setae. Gonapophysis a slender, narrow, chitinised rod, attached to dorsal inner surface of the basistyle, apex uneven, lower mesal surface giving rise to a chitinised rodlike projection, apex of which is acute. The conspicuous aedeagal structure deep, broad, cup-shaped, surrounding the penis, the dorsal caudal angle of the cup pronounced, subglobular; lateral base of cup giving rise to a bladelike projection, inner margin of which has a minute constriction. Penis with slightly bulbous base, tapering gradually to a narrow tip.

Alexander in his description of the holotype male (1917, p. 156) ("this very interesting fly is, unfortunately, not in good condition") states cell M_1 is absent. A careful re-examination of the holotype and of sixty-three perfect specimens revealed that cell M_1 is present (fig. 69, a), being formed by the branching of M_{1+2} , the petiole (M_{1+2})

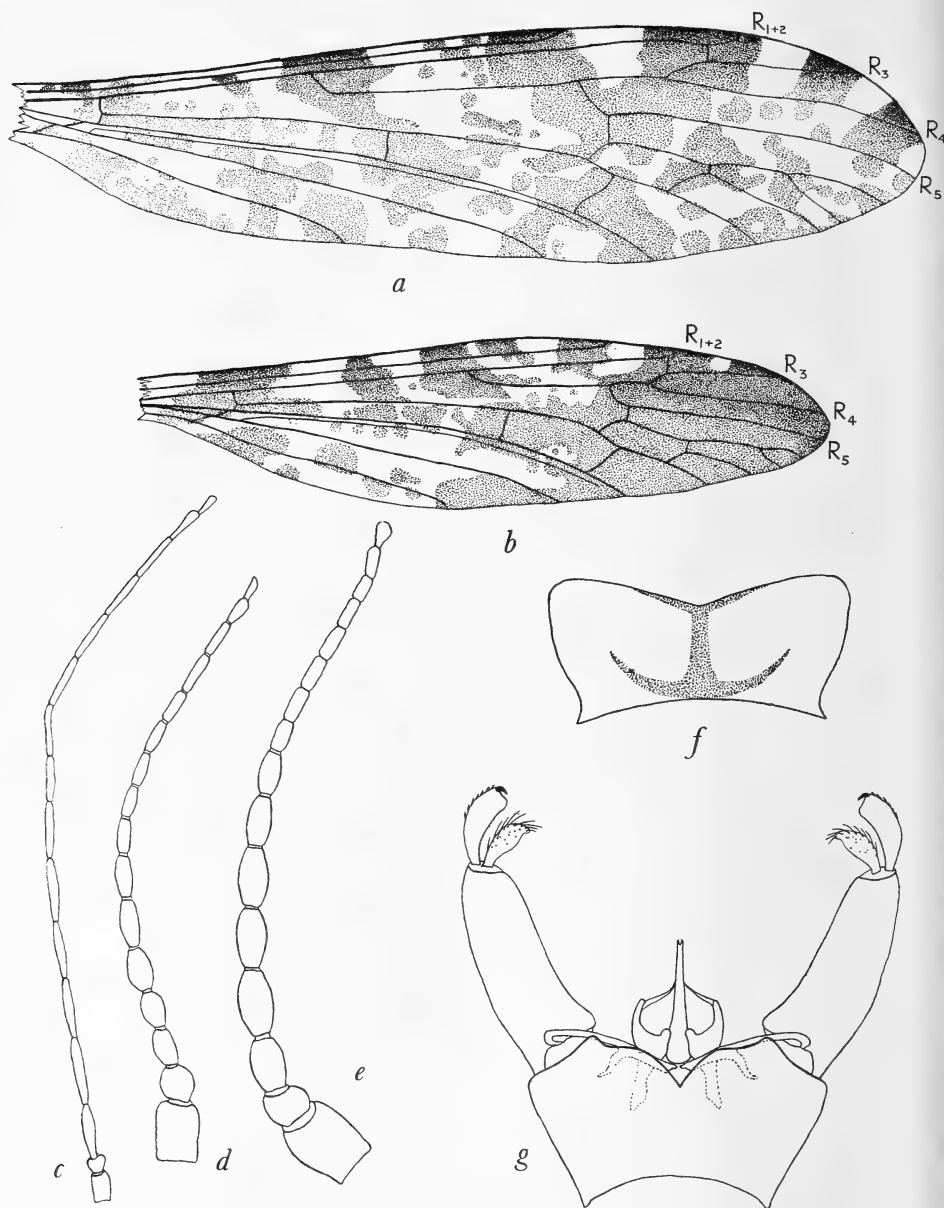


FIG. 69.—*Limnophila dubiosa* Alex. *a*, wing of male and "major" female; *b*, wing of "minor" female; *c*, male antenna; *d*, "major" female antenna; *e*, "minor" female antenna; *f*, ninth sternite (ventral view); *g*, male hypopygium (dorsal view).

being equal in length to the vein M_1 in the male. Occasional females possess M_{1+2} about twice the length of vein M_1 .

Great variation occurs in the shape of the antennae and in the wing venation and markings of the females, which, however, fall into two more or less distinct groups. The *major* group, in which the wing markings resemble those of the males, has the petiole slightly less than the vein M_1 . The antennae of this group are as follows: scapal joint 1 as broad as long, scapal joint 2 less broad than previous joint, globular (fig. 69, *d*); flagellar joints 1–3 longer than the second scapal joint, oval; joints 4–5 elongate-elliptical, being the longest joints; joints 6–10 uniform in shape and length, narrow, shorter than joint 4 or 5; joints 11–12 somewhat longer than joints 6–10, penultimate and ultimate joints equal in length, each shorter than joint 11 or 12, penultimate joint dilated at apex, ultimate joint cylindrical, with a few setae at tip. Pubescence as in male.

The *minor* group has the petiole twice the length of vein M_1 and the apices of the wings more densely clouded, the entire apical portion being suffused with dense blackish brown as figured (fig. 69, *b*). The wings are narrower than those of the *major* group. The antennae are as follows (fig. 69, *e*): shorter than those of the *major* group, about two-thirds the length of *major* group; scapal joint 1 longer than broad, scapal joint 2 subglobular, relatively larger than that of *major* group; flagellar joint 1 oval to subglobular, longer than the previous joint but less broad; joints 2–4 slightly longer than first flagellar joint, elongate-oval, the longest joint of the flagellum; joints 5–6 slightly shorter but of similar shape; joints 7–12 uniform in shape, length and width but shorter than joint 5 or 6, cylindrical, narrow; penultimate joint undilated; ultimate joint piriform, shorter than previous joint. Pubescence as in male.

A small percentage of females (less than 5 per cent.) reveal the markings of the *minor* group yet possess the wing venation characteristic of the *major* group.

Localities.—Cape Peninsula: Fernwood and Nursery Ravines (K. H. B., C. W. T., H. G. W.); Platteklip (K. H. B., H. G. W.); Chapmans Peak (H. G. W.), January 1934.

Cape Province: Stellenbosch (K. H. B.), April 1931; du Toits Kloof (West side) (C. W. T., H. G. W.), April and October 1934; (G. A. W., H. G. W.) September 1934; Seven Weeks Poort (K. H. B., C. W. T., H. G. W.), January 1935; Palmiet River (G. A. W., H. G. W.), January 1937.

Larva.—Length 15–17 mm. (gills 2 mm.); diameter 1.2–1.5 mm., of distended ring 1.8–2 mm., at spiracular disc .8 mm. Colour dull opaque white, penultimate segment warm buff.

Body slender, terete, pro- and mesothoracic segments slightly narrowed, former truncate anteriorly; hyaline tips of maxillary palpi projecting from the prothoracic orifice; ultimate segment narrowed; frequently penultimate and ultimate segments distended to a pronounced ring. Integument with microscopic appressed pale yellow pubescence on dorsal and ventral surfaces, giving body a pale cream coloration. Abdominal segments 2–6 with a bare white transverse stripe giving the appearance of false segmentation at the anterior third of the true segment, not apparent on the lateral surfaces.

Chaetotaxy: prothoracic dorsum and venter with three short, single setae near anterior margin in the form of an equilateral triangle, apex posterior; two tufts of longer setae in mesal region, a tuft at level of apex of triangle on each pleural region. Meso- and meta-thoracic segments with two of four dorsal, two lateral and two or four ventral tufts forming a ring anterior to mid-region of segment. Abdominal segment 1 with a ring of four dorsal, and two ventral tufts posterior to mid-region, two ventral and two lateral tufts near anterior margin. Abdominal segments 2–7 with two lateral anterior tufts, posterior to this another two lateral tufts; a ring of four dorsal and two ventral tufts near posterior margin; frequently segments 1–7 with two extra ventral tufts near mesal region of segments. Penultimate segment bare; ultimate segment (fig. 70, *f*) with a lateral tuft of setae anterior to junction of spiracular disc; a dorsal fringe of hairs, directed cephalad, at junction; immediately posterior to junction a lateral tuft, on the diagonal intermediate between this tuft and the spiracle a similar tuft, directed dorsad; four ventral tufts, the outer pair at the tips of and the inner pair at the base of the anterior anal gills.

Spiracular disc (fig. 70, *f*) surrounded by four lobes, densely fringed with delicate black hairs of varying length, those at the apices of lobes the longest, about one-half the length of the lateral lobes, which at most are somewhat shorter than ventral pair; inner surfaces of lobes bare, white. Spiracles situated at base of lateral lobes, just visible from a dorsal aspect, margined by a ring of dark brown. Anal gills four, stellate, stout, short, about twice the length of diameter on anus, white, apices bluntly rounded.

Head capsule (fig. 70, *e*) very dissected, consisting of four membranous plates, the dorsal pair margined by a heavily chitinised rod,

pronounced at cephalic end and produced inwards, apex fused to a short narrow chitinised rod on the same plane as the base of the labrum, the apex of this rod fitting into the posterior indentation of the labrum; lateral pair of plates convex, with two narrow rods of chitin near the margins, articulating ventrally with the caudal ends of lateral rods of the mentum, dorsally at the area of heavy chitination of head capsule. Antenna (fig. 70, *b*) apparently unsegmented, long, slender, flattened, the basal half chitinised, this chitination abruptly narrowed and continued as a slender rod for a short distance, apical portion hyaline, with a large, hyaline, bi-segmented papilla near the apex, situated on the caudal surface as the antenna is curved caudally; first segment of papilla short, broad, with a basal seta on caudal face, this seta slightly less than the length of the second segment, latter segment elongate-conical, tip rounded, base with a narrow finely-sculptured annulus; tip of antenna narrowed, with two closely placed minute papillae at apex. Mandible (fig. 70, *a*) massive, heavily chitinised, tip produced to a slender point, cutting-edge at mid-length with a single row of four flattened teeth, varying in shape, usually the two anterior teeth slender, sharply pointed, the third the largest, tapering to a blunt apex, the fourth truncate apically. Maxilla with base chitinised, this chitination abruptly narrowed at origin of outer lobe, continued up along outer margin to tip of lobe, remainder of outer lobe hyaline, apex with two minute papillae; palpus reduced to a mere rounded swelling on inner face. Labrum (fig. 70, *d*) broad, postero-lateral corners rounded, the whole chitinised except the thin hyaline membrane connecting the postero-lateral corners to the ends of the lateral projections of the labrum, these projections arising near the antero-lateral corners of labrum and projecting caudally; mesal posterior margin indented slightly on either side of the median rounded lobe; anterior margin rounded, produced to two large hyaline median protuberances, the edges of which are concave with a single pointed seta; near inner base of each protuberance a hyaline papilla, tip rounded; adjacent to its base a chalaza; posterior to its base a minute papilla; an odontoid process at outer margin of each protuberance; sides of epipharynx with an anterior brush of elongate delicate setae intermingled with three to four stout setae. Mentum (fig. 70, *e*) a heavily chitinised bar, ungrooved, articulating with two lateral chitinised rods which in turn articulate at their bases with the ventral rods of the lateral capsule plates. Immediately dorsad to the mentum bar is a pair of elongate papillae (comprising the prementum), each papilla with a secondary

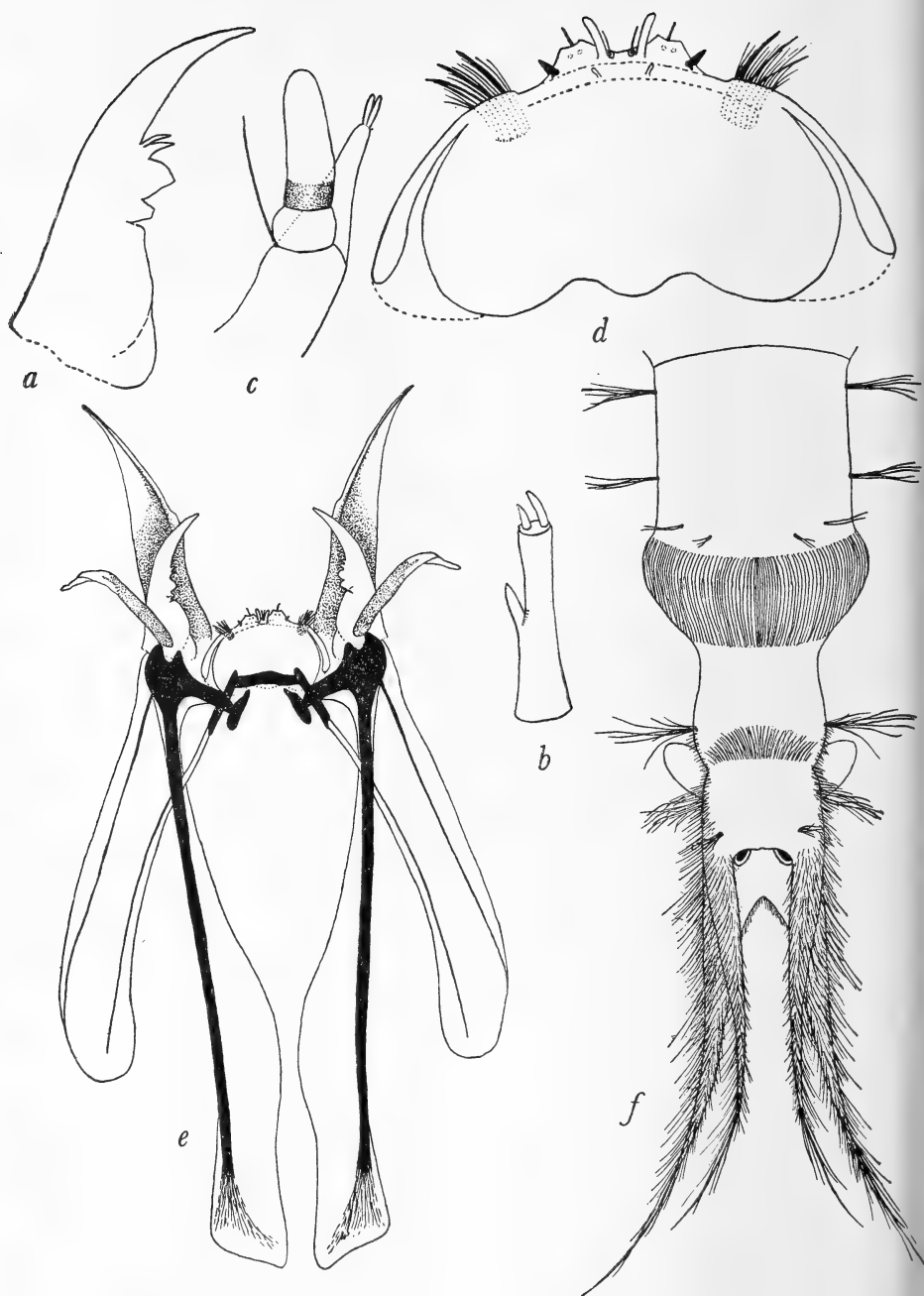


FIG. 70.—Larva of *Limnophila dubiosa* Alex. *a*, mandible; *b*, antenna; *c*, tip of maxilla; *d*, labrum (dorsal view); *e*, head capsule (ventral view); *f*, end of abdomen (dorsal view).

papilla on the inner face about mid-length, two apical papillae, the outer slightly longer and more slender than the inner papilla.

Pupa (fig. 71, e).—Length 9 mm., diameter 1.2–1.8 mm. Colour sepia, mature pupae dark blackish brown; breathing horns light brown with a central annulus, which is more pronounced on inner surface, apparent even in exuviae; incisures of abdominal segments in distended exuviae pale brown.

Cephalic crest small, consisting of two closely placed but separate conical lobes, apices with three setae directed cephalad, another seta on outer face above a minute indentation. Labrum (fig. 71, d) broad, tapering abruptly to a broad truncate tip. Labial lobes thick at origin, terminating in narrow proximad-directed chitinated points. Maxillary palpi short, thick at their origin, tapering gradually to blunt apices. Antenna of male greatly elongated, apex opposite one-third the length of wing pad, origin at inner margins of the eyes slightly crenulate; antenna of female shorter than that of male, apex opposite one-quarter the length of wing pad. Thoracic pronotum flattened, carinate medially, the carina continued caudally to mid-length of the high convex mesonotum. Pronotal breathing horns (fig. 71, b) cylindrical, divergent, each about length of head, uniformly wide, edges crenulate to mid-length, pore pronounced, edges unserrated. Wing pads end immediately before the posterior margin of abdominal segment 2, with typical Limnophilan venation. Leg sheaths short, extending to posterior transverse row of spines on abdominal segment 3, apices of tarsi level.

Abdominal segments flattened dorso-ventrally, especially in the ♀; lateral margins of abdominal segments deeply incised, the carinate margins consequently being pronounced and bladelike, each segment indistinctly divided into two annuli by a false constriction; posterior annulus twice the length of basal one. Numerous stout spines of varying shapes and sizes (fig. 71, a, c), caudally directed, comprise the abdominal armature. The dorsum and venter of basal annulus of each segment except 1, and the venter of abdominal segment 2 with transverse row of these spines; carinate margins of this annulus bare; dorsum and venter of each posterior annulus except abdominal segment 1 with a subterminal transverse row of spines; mesal surfaces with several scattered spines arranged in three longitudinal rows of two spines (fig. 71, a); some pupae with four longitudinal rows of three to five spines; the spines on the venter without setae; those on the dorsum setiferous, shape as in fig. 71, c. Carinate lateral margins of this annulus with a single stout acute spine on the same level as

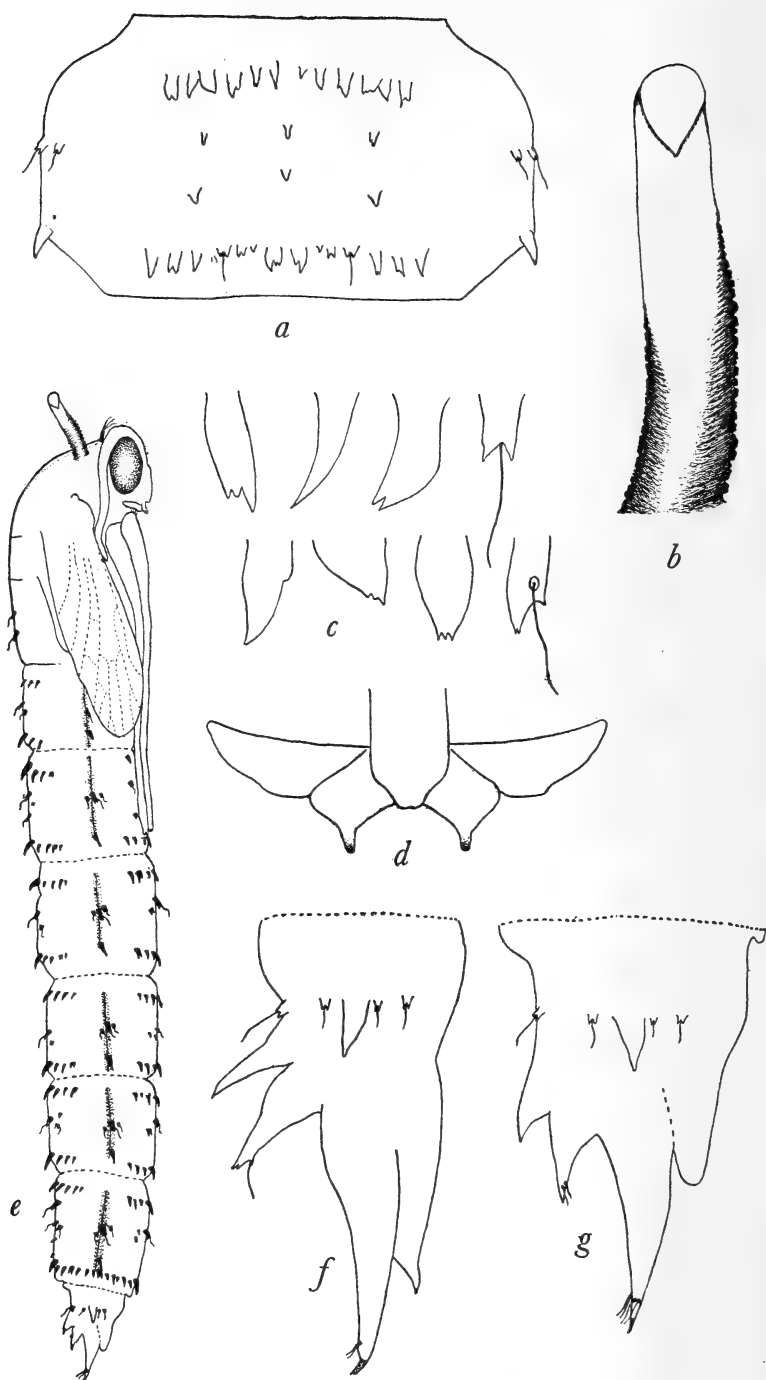


FIG. 71.—Pupa of *Limnophila dubiosa* Alex. *a*, fifth abdominal segment; *b*, pronotal breathing horn; *c*, spines on abdominal segments; *d*, mouth parts; *e*, pupa (lateral view); *f*, female cauda (lateral view); *g*, male cauda (lateral view).

the subterminal transverse row; anterior to this spine three smaller stout bifid setiferous spines (fig. 71, *a*). Dorsum of abdominal segment 1 with two stout median setiferous spines. Venter of abdominal segment 2 with three evenly spaced stout spines, adjacent to hind tarsi, middle spine setiferous; subterminal posterior transverse row of spines present. Subterminal ring of spines of abdominal segment 7 completely encircling the segment posteriorly.

♂ cauda (fig. 71, *g*): Tergal sheaths elongate, divergent, broad at base, tapering to acute tips which bear on either side of the median line two small closely placed subterminal setae, not projecting beyond tips of the sheaths; sternal sheaths short, broad, fused medially from a ventral view to near the bluntly rounded apices; dorsum of eighth segment with a square of four elongate massive lobes tapering to acute tips, the posterior pair of lobes longer and stouter, each with two ventral subterminal setae; frequently two additional setae placed cephalad on the dorsal surface; at base of each anterior lobe a blunt bifid setiferous spine. On the same level as this spine on the pleural region a large bare elongate lobe, acute, equal in size to the dorsal anterior lobe; two small bifid setiferous spines, one dorsad, the other ventrad to this pleural spinelike lobe; on the pleuro-sternal margin another setiferous spine.

♀ cauda (fig. 71, *f*): Tergal sheaths elongate, slender, fused from a dorsal aspect, tapering to narrowly rounded tips which bear a small, slightly curved, acute spine, terminal in position; two to three subterminal setae on dorsal surface; sternal sheaths slender, narrowing to acute, somewhat hooked tips. Dorsum of eighth segment with square of four lobes; posterior pair very broad at base, stout, tips trilobed with a single seta on inner lobe; anterior pair of lobes broad basally, tapering to acute tips; remainder of armature as in male.

Remarks.—The immature stages of *Limnophila dubiosa* are to be found in gravelly sandy spits and in organic saturated mud at the margins of shallow streamlets and rills. Pupation occurs in the drier areas of these sandy spits. Average duration of pupal stadium is nine days.

Some forty pupae were collected in an area of one square foot at Fernwood Ravine (November 1933) and from these both the *major* and *minor* types of females were reared.

Specimens from the first three localities listed reveal a continuous sequence of imagos from 11th November to 23rd April, with an optimum emergence on 16th November (Nursery Ravine) and 4th December 1932 (Platteklip). The adults occur on the lower sides

of the boulders and on the undercut banks of streams in shaded woods, being easily recognisable in the field by their black colour, the supernumerary cross-vein in cell M and the heavily spotted wings. They are characterised by a shuffling sideways gait and seem loath to fly from their resting position, in which the wings are folded lengthwise over the abdomen.

Teneral imagos are frequently found with the abdominal pleurites distended to a remarkable extent. It is probable that the imago, as its thorax protrudes from the thoracic split of the pupal hull, inflates the abdomen in order to facilitate its emergence. Soon after, the distended pleurites are invaginated beneath the lateral scalloped hairy margins of the sclerites and the tergites as the abdomen commences to flatten dorso-ventrally.

Edwards (1921, p. 220) ranked *Idioptera* as a distinct genus, stating "*Idioptera* as a whole differs from the other genera of the *Limnophila* group in possessing an extra cross-vein in the lower basal cell, but the distinction is not by any means a fundamental one. The cross-vein is occasionally absent in one or both wings of *I. pulchella* Mg., and *I. marmorata* Mg."

Alexander (1917, p. 157) indicated that this species was of the subgenus *Idioptera* of the genus *Limnophila*.

The immature forms of this species possess the typical characteristics of the genus *Limnophila* Macquart given by Alexander (1920a, p. 858) and are closely allied to those of *Limnophila nox* and *L. crepusculum*. The slight differences which do exist are considered by the author to be specific. Accordingly, the ranking of *Idioptera* as a distinct genus (or even subgenus), chiefly on the presence of the supernumerary cross-vein in cell M of the wing in the adult fly, is scarcely valid.

Limnophila crepusculum sp.n.

Figs. 72, a, b; 73, a-e; 74; 75; 76, a.

♂: Length 6 mm., wing 5.5 mm. Head, rostrum and palpi dark umber brown; antennae (fig. 72, a) short, black; scapal joint 1 twice as long as broad, cylindrical; scapal joint 2 broad, globular; flagellar joints 1-3 subglobular, enlarged, becoming abruptly less broad and slightly shorter; joint 4 equal in length to previous joint, short-oval; joints 5-14 elongate-cylindrical, slender; ultimate joint

subpiriform, equal in length to the twelfth joint, about one-half as long as the penultimate joint.

Pronotum large, praescutum pronounced, rectangular. Mesonotal praescutum, scutum and scutellum unicolourous, umber brown, with a yellowish brown sheen, postscutellum light brown, posterior margin narrowly banded with black. Pseudosutural foveae pronounced, black. Pleura similar in colour to dorsal sclerites, unicolourous except for the pale brown metepisternum and metepimeron. Wings dark brownish black, veins dark brown. Venation as in *Limnophila nox*. Halteres light brown; trochanters black, remainder of legs dark umber brown.

Abdomen a lighter brown than the thorax, segments 7-9 darkened. Dorsal caudal margin of ninth segment as in fig. 73, *b*; ventral margin produced, underlying the aedeagus. The hypopygium (fig. 73, *b*) is similar in general form to that of *Limnophila nox*. The pronounced ventro-basal lobe on the basistyles is covered with a pubescence of stunted, closely placed setae. Outer dististyle (fig. 73, *b*, *c*) uniformly wide in the basal half (viewed dorsally), dilated towards its apical bifurcation (lateral view) (fig. 73, *c*), the dorsal prong merely a rounded protuberance, scarcely apparent when viewed dorsally, ventral prong prominent, tapering to its bluntly rounded apex, inner ventral margin with several stout setae. Ventral surface of the cup-like aedeagus with a short pubescence (fig. 73, *a*), tips of structure elongated dorsally into acute hooks.

♀: Length 6-9.5 mm., wing 6.5-8 mm. Similar in colour and venation to male. Antennae (fig. 72, *b*) similar to those of male; terminal portion of flagellum (joints 5-14) slightly shorter than in male, short-cylindrical, moderately elongate, penultimate joint equal in length to previous joint, ultimate joint uniformly wide, tip rounded, about one and a half times the length of penultimate joint.

Ovipositor: tergal valves (fig. 73, *e*) short, broad basally, tapering to rounded apices; sternal valves (fig. 73, *d*) short, stout, apices bluntly rounded, bearing numerous (more than ten) delicate setae; lateral gonapophyses extending to apices of sternal valves, tips setiferous.

Localities.—Cape Peninsula: Kasteels Poort (K. H. B.), January 1933 and 1934; Platteklip (K. H. B., H. G. W.), December 1933; (K. H. B.) November 1934; Orange Kloof (K. H. B., C. W. T., H. G. W.), January and March 1934; Red Gods (K. H. B.), January 1933.

Larva.—Length 12-14 mm., diameter 1.5 mm., of distended ring

1.8 mm. Colour, with the exception of the bare pale yellow eighth abdominal segment, a dark golden-yellow, due to the long luxuriant pubescence of the integument.

Body slender, terete, slightly narrowed towards distended ring, segments distinct, prothoracic segment tapering slightly, truncate anteriorly; penultimate segment distended to a pronounced ring; ultimate segment narrowed, with an indentation on lateral margins

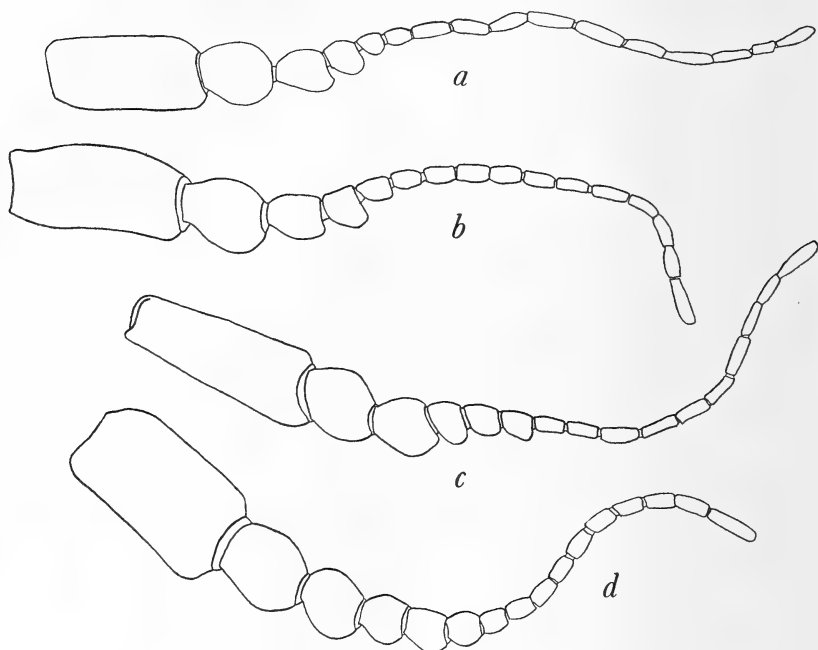


FIG. 72.—*Limnophila crepusculum* sp.n. a, male antenna; b, female antenna. *Limnophila nox* Alex. c, male antenna; d, female antenna.

prior to apical half which is as broad as long, apex of segment abruptly narrowed, spiracular disc dorsal in position.

Chaetotaxy indistinct due to integumental pubescence. Mesal lateral margins of thoracic segments with a tuft of two to three long delicate setae; prothoracic segment with two separate additional setae on anterior margin. Abdominal segments with similar tufts on caudal lateral margins. Basal half of ultimate segment, cephalad to the indentation, with a single seta near lateral surface; on anus level a ring of four ventral evenly spaced setae, apical half of segment with two elongate cephalad-directed setae on either side of median line,

situated cephalad to anterior lobes of spiracular disc, the outer seta the longer; laterad of each spiracle a single seta.

Spiracular disc (fig. 74, *f*) minute, elongate-oval in outline, with four minute lobes, anterior pair small and inconspicuous, rounded, posterior pair distinct, narrowly separated by a minute indentation; edges of disc with moderately long pale hairs which emerge with those on the apices of the posterior pair of lobes, the latter hairs being of varying lengths, gradually increasing in length until the inner ones are about three to four times the length of the ultimate segment. Ventrad to the disc several long setae, directed caudo-laterally. The spiracles are inclined towards one another, oval, outer margins pale brown, inner portion dark brown. Anal gills four, white, stellate, short, stout, globular, equal in length.

Head capsule (fig. 74, *e*) very dissected, consisting of six membranous plates, the dorsal pair margined by a heavily chitinated rod, pronounced at cephalic end; this area of heavy chitination produced inwards, apex truncate, inner mesal surface with two setae, outer much elongated, delicate; inner short, one-quarter the length of outer; lateral plates one-half the length of dorsal plates, convex, apices rounded; ventral plates slender, narrow, apices truncate, each with a chitinated central rod connected by a short, narrow, chitinated rod to the broad, flat plate arising from the caudal end of each of the lateral rods. Antennae (fig. 74, *a*) bi-segmented, basal segment broad, second segment elongate-cylindrical, tapering slightly to a square apex which bears an elongate-cylindrical papilla, about the length of the previous segment, two minute papillae and an inner seta twice the length of the largest papilla. Mandible (fig. 74, *b*) massive, powerful, heavily chitinated, tip produced to a slender point; cutting-edge at mid-length with a single row of three large bladelike teeth, the cephalic tooth rounded, the second tooth the largest, broad, tapering to an acute point—at the junction of these two teeth a small, slender, acute spine, hardly toothlike in calibre; caudal tooth broad, apex blunt; base of mandible not swollen, uniformly wide to origin of caudal teeth. Maxilla with broad base, chitinated for one-half of its length, this chitination then abruptly narrowing to a slender short rod, apical portion of lobe gradually narrowed to a slender point, bearing a single minute papilla; two closely placed setae on inner mesal margin (fig. 74, *e*). Labrum (fig. 74, *d*) broad, dorsal surface with three pronounced blunt teeth on either side of median line, outer teeth the broadest, partially concealing three to four small acute spines. Adjacent to outer edge of mid-tooth occur four spines

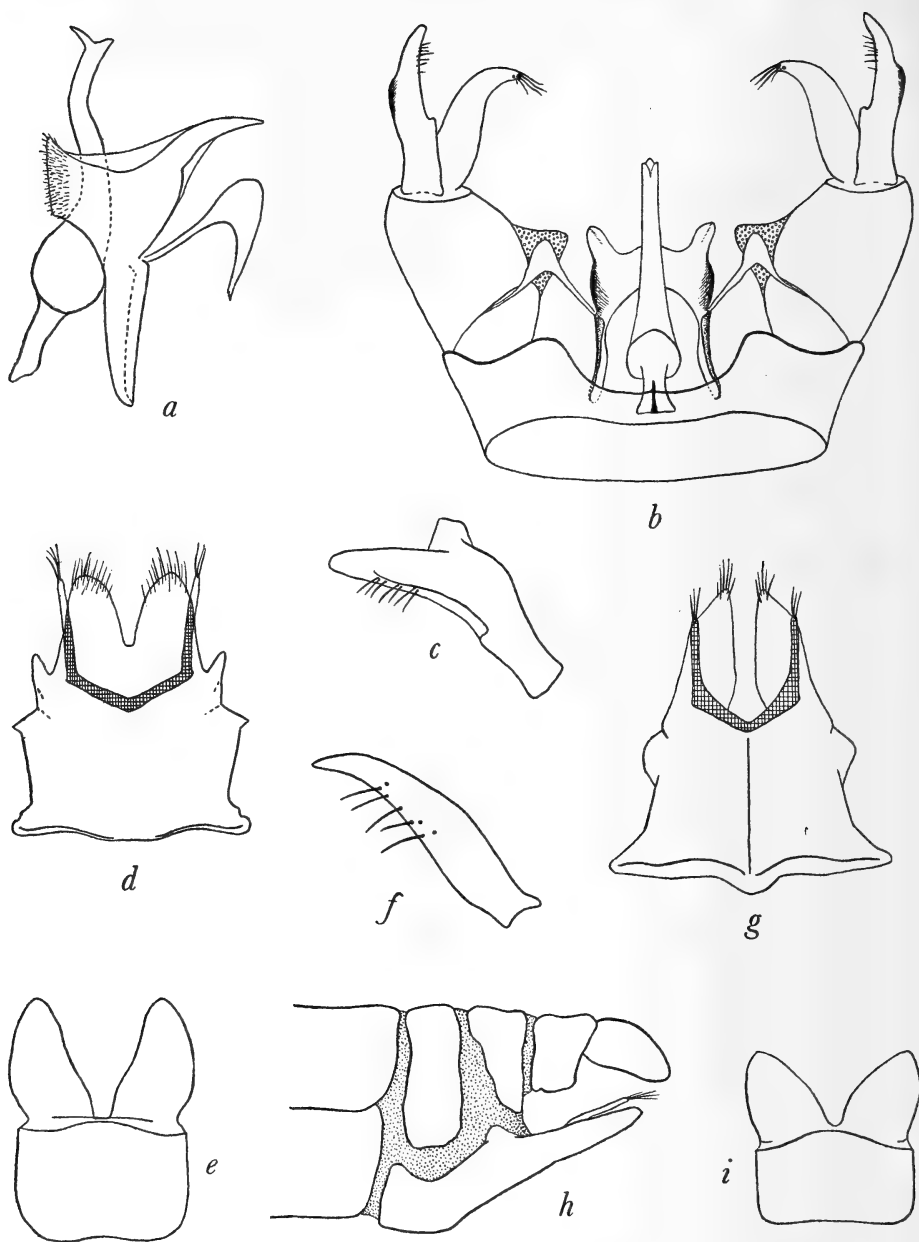


FIG. 73.—*Limnophila crepusculum* sp.n. *a*, penis and aedeagal sheath (lateral view); *b*, male hypopygium (dorsal view); *c*, outer dististyle (lateral view); *d*, ventral valves of ovipositor; *e*, dorsal valves of ovipositor. *Limnophila nox* Alex. *f*, outer dististyle (male hypopygium); *g*, ventral valves of ovipositor; *h*, end of abdomen (lateral view); *i*, dorsal valves of ovipositor.

situated near anterior margin of labrum which swells abruptly to a marked protuberance, the anterior margin of which bears ten slender, acute spines, the mid-spines the largest, each outer spine with an elongate seta, the third spine setiferous, the seta being one-half the length of its neighbour. Between this protuberance and the dorsal tooth is a broad pronounced median lobe or tooth, anterior edge irregular, bluntly serrate; immediately laterad and partially concealed occur two closely placed papillae; farther laterad and somewhat anterior two additional papillae. Mentum consists of two lateral rods articulating with the transverse bar (fig. 74, c), the ventral outer surface of each lateral rod bearing the minute flattened lobe which forms the inconspicuous prementum, these flattened lobes projecting inwards and bearing a series of closely placed teeth, the teeth at the origin of the lobe minute, arranged in two definite rows, the outer row soon disappearing, the inner row replaced by more elongate slender acute teeth which at the cephalic portion of the lobe occur in two rows; the transverse bar with two to three rows of teeth similar in shape to the longest teeth on the above-mentioned lobes, situated ventrally and caudally—these teeth projecting into the gullet of the larva and apparent only under high magnification.

Pupa (fig. 75, e).—♂, length 7–8.5 mm., diameter .8–1 mm.; ♀, length 8.5–9.5 mm., diameter 1.5 mm. Colour yellowish brown, pronotum darker due to the heavier chitination; mature pupae darkened blackish brown; breathing horns dark blackish brown at origin, apical half gradually paler, tip pale yellow; incisures of the abdominal segments in mature pupae pale brown.

Cephalic crest inconspicuous, reduced, apparent only as two low, closely situated ridges between the relatively high antennal sheaths (ventral aspect); upper surface of each antennal sheath (fig. 75, a) between the eyes with two minute truncate protuberances, followed by two pronounced conical lobes, the proximal lobe the larger, tapering to acute apex; from a lateral aspect these lobes and protuberances of antennal sheath, unless carefully examined, appear to comprise the cephalic crest; apex of antennal sheath opposite the lower margin of eyes. Labrum (fig. 75, c) broad basally, tapering to truncate apex; frequently labrum is somewhat elongated and separates the labial lobes which are thick at their origin, short, rectangular, apices truncate. Maxillary lobes rounded and thick at origin, short, narrowing suddenly to blunt points.

Thoracic pronotum convex, flattened slightly posteriorly, with a low median carina; a low lateral ridge extending from the base of

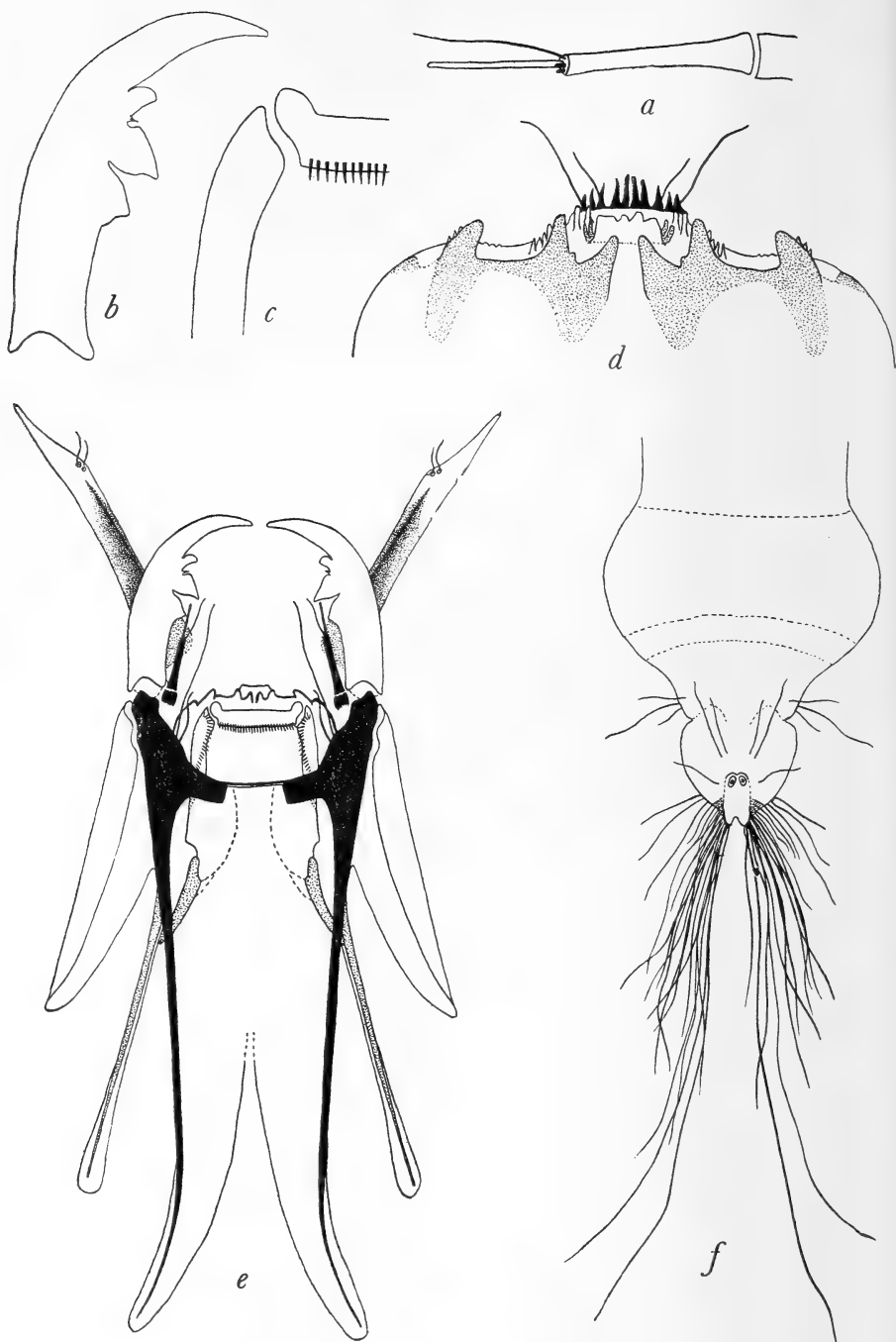


FIG. 74.—Larva of *Limnophila crepusculum* sp.n. a, antenna; b, mandible; c, ends of lateral bar and transverse bar of mental region; d, labrum (dorsal view); e, head capsule (ventral view); f, end of abdomen (dorsal view) with spiracular disc.

breathing horn to near the origin of the wing pad. Pronotal breathing horns (fig. 75, *d*) directed slightly laterad, short, wide at origin, tapering gradually to the apex, edges somewhat crenulate, pore prominent. Mesonotum high, convex, armed with four prominent chitinised spinelike protuberances on either side of median line (fig. 76, *a*), the anterior protuberance a definite lobe, produced laterad and ventrad to a decided chitinised crest terminating immediately ventrad of wing pad (fig. 75, *e*); the apex of lobe (lateral view) acute, broadly rounded (fig. 75, *e*); (caudal aspect) remainder of mesonotal armature spiniform, the spines 2, 3 and 4 equal in length, the fourth or posterior spine with a slight low lateral crest, laterad of both spines 2 and 3 a single smaller spine. Metanotum with a spine on either side of median line. Outer leg sheath short, longer in male than in female; in former ending opposite tip of basal annulus of abdominal segment 4, in latter opposite posterior margin of segment 3. Wing pads end opposite posterior margin of abdominal segment 2, with the typical *Limnophilian* venation.

Abdominal segments broad, the segments of some females slightly longer than those of males; lateral margins scarcely incised; each segment divided into two annuli by a false constriction; posterior annulus less than twice the length of basal one. Abdominal segments have armature consisting of numerous spines caudally directed, of uniform shape (fig. 75, *f*), each spine bearing mesally a short seta which does not extend beyond the apex of spine. Dorsum and venter of basal annulus of each segment except abdominal segment 1 and the venter of abdominal segment 4 with a transverse subterminal row of spines which on the dorsa of segments are larger than those on the remaining segments; pleural region of this annulus with two separate spines near anterior margin. Dorsum and venter of each posterior annulus with a subterminal transverse row of spines, this row connected to that on the venter of segments 3-7 by a few scattered smaller spines on the pleural region; mesal surface of venter of segments 2-3 frequently with three scattered spines; mesal surface of venter of segments 4-7 with from one to two spines; the spiracles of the mesal pleural region of segments 2-7 surrounded by three to four spines. Dorsum of abdominal segment 1 (basal annulus) with a large spine on either side of median line; laterad and slightly cephalad two to three single smaller spines. The transverse row of spines on the venter of abdominal segment 4 (basal annulus) replaced by two to four scattered spines between the tarsal sheaths. The venter of basal and posterior annuli of abdominal segments 3-7 have scabrous areas

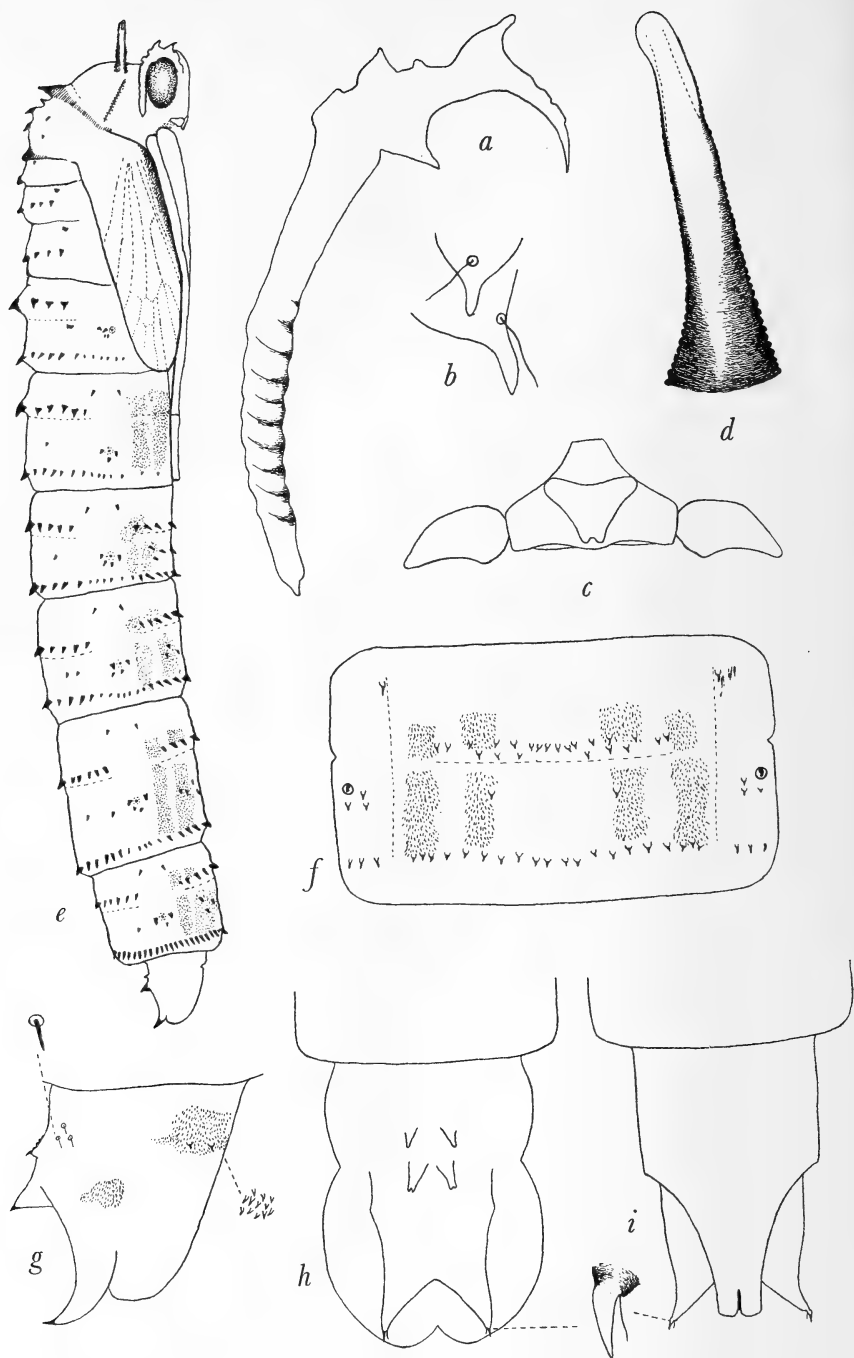


FIG. 75.—Pupa of *Limnophila crepusculum* sp.n. *a*, antennal sheath; *b*, spines on abdominal segments; *c*, mouth parts; *d*, pronotal breathing horn; *e*, pupa (lateral view); *f*, fifth abdominal segment (ventral view); *g*, male cauda (lateral view); *h*, male cauda (dorsal view); *i*, female cauda (ventral view).

of varying shape and size, those areas on the posterior annuli the larger (fig. 75, *f*).

♂ cauda (fig. 75, *g, h*): Sternal sheaths large, broad, stout, bulbous, fused to near the bluntly rounded apices, completely hiding the tergal sheaths (from ventral aspect); tergal sheaths slightly shorter than sternal sheaths, conical, wide at origin, tapering to divergent, acute, dorsally directed points which bear an inner dorsal seta, not projecting beyond the apex of the sheath. Dorsum of abdominal segment 8 with a raised square of four lobes in mesal region, the lobes acute, closely situated, caudal pair the larger. Ventrad to each anterior lobe are three slender spines; on the pleural region (ventrad to each posterior lobe) a scabrous area; on venter a larger scabrous area, with two minute mammilate spines near caudal margin.

♀ cauda (fig. 75, *i*): Similar to that of male, the divergent tergal sheaths more distinctly divided from the sternal sheaths; latter sheaths shorter than those of male, slender, fused to near their rounded apices.

Remarks.—The adult flies are closely allied to those of *Limnophila nox* Alex. in general appearance and wing venation. They are readily distinguished by the shape of the antennae and by the details of the hypopygium or by the ovipositor valves.

The males frequently swarm together above the low banks of a streamlet, dancing round and round in caddislike flight. The adults occur on the small pebbles on the edge of the water, resting on raised sandy spits beneath undercut boulders in the stream-bed. Pupal cases from Platteklip and pupae from Orange Kloof were found among the gravelly sand spits and small pebbles of the watercourse, being sheltered from the direct stream by undercut boulders. At Orange Kloof the larvae frequented the more moist areas of the stream-bed, over which percolated a thin film of water.

Average duration of pupal stage is seven days.

Limnophila nox Alex.

Figs. 72, *c, d*; 73, *f-i*; 76, *b-f*.

1921. pp. 207–208, pl. iii, fig. 7 (wing).

Additional notes are as follows: specimens from the localities listed below are larger than either the holotype or the paratype, being: ♂, length 7–8 mm., wing 6–7.5 mm.; ♀, length 9–10 mm., wing 8 mm.

Antennae of male "short, black; basal flagellar segments subglobular, enlarged, broader than long, the terminal flagellar segments slender, elongated, with long black bristles" (Alexander, pp. 207-208).

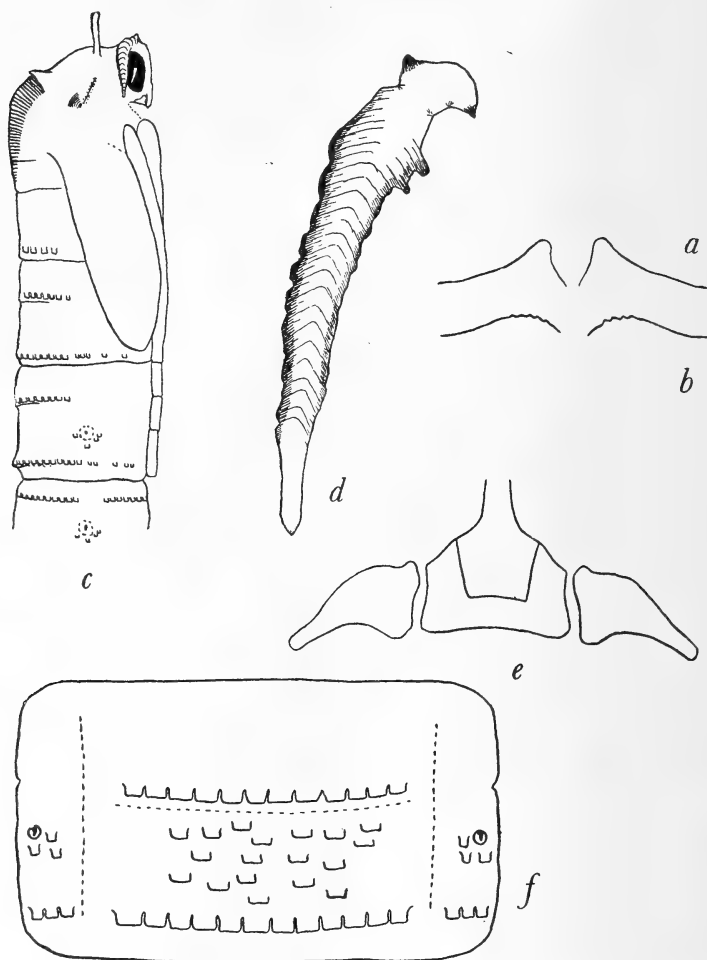


FIG. 76.—Pupa of *Limnophila crepusculum* sp.n. a, ridge of thorax. Pupa of *Limnophila nox*. b, ridge of thorax; c, anterior portion of pupa (lateral view); d, antennal sheath; e, mouth parts; f, fifth abdominal segment (ventral view).

For distinguishing this species from *Limnophila crepusculum*, the shape of these basal flagellar joints is important. Male flagellum (fig. 72, c): joints 1-4 subglobular, enlarged, the first joint the largest; joints 2-4 gradually becoming less broad, about equal in length; joints 5-14

forming the terminal portion of flagellum; joints 5-6 equal in length and size, abruptly narrower but slightly longer than joint 4, slightly shorter but otherwise similar to the remaining joints, which are uniform in shape, size and pubescence; ultimate joint slightly longer than previous joint, apex rounded.

Female flagellum (fig. 72, *d*): joints 1-4 as in male; joints 5-6 not abruptly narrowed as in male, since they are broader than those of male, short-cylindrical, slightly shorter than joint 4; remainder of flagellum except the ultimate joint short-cylindrical, being shorter yet broader than in male; ultimate joint elongate-cylindrical, about twice the length of penultimate joint, apex rounded. Pubescence as in male.

Pleura lighter brown than dorsal sclerites of thorax, with a consequent contrast in thoracic coloration (which is absent in *L. crepusculum*). Abdomen brownish-grey pruinose; ninth segment ring-like, ventral margin not produced as in *L. crepusculum*. Alexander's description of the male hypopygium (p. 208) reads: "male hypopygium with the pleurites (*basistyles*) short and stout, the two pleural appendages (*dististyles*) relatively small, the outer appendage (*outer dististyle*) a little longer but narrower than the fleshy inner appendage (*inner dististyle*). Penis-guard (*aedeagus*) slender, almost straight; gonapophyses with the tips slender, acute." (Author's italics.)

From this it is evident that the male hypopygium of this species is exactly similar to that of *L. crepusculum*, except for the absence of the ventro-basal lobe on the basistyles and the shape of the outer dististyle. The latter appendage is slender, uniformly wide for most of its length, tapering to an acute tip; inner mesal surface with ten to eleven setae (fig. 73, *f*).

♀: Similar in colour and general appearance to male. Ovipositor: tergal valves (fig. 73, *h*, *i*) short, broad, stout, abruptly rounded; sternal valves (fig. 73, *g*) clearly separate from one another at their bases, narrow, apical portion tapering to a subacute tip, bearing six to ten delicate setae; lateral gonapophyses not extending to apices of sternal valves, tips setiferous.

Localities.—Cape Peninsula: nil.

Cape Province: French Hoek Pass (East side) (K. H. B., H. G. W.), October; (G. A. W., H. G. W.) September 1933; Landdrost (K. H. B., C. W. T., H. G. W.), January 1933; Oudebosch (3000 ft.) (K. H. B.), January 1934.

Larva.—Length 11.5-12 mm., diameter 1-1.2 mm. Similar to *L.*

crepusculum in shape, head capsule and spiracular disc. The chief differences, by which this larva can be distinguished (even in the field) from that of *L. crepusculum*, are in the general coloration and in the scantier integumental pubescence.

General coloration white or cream; pubescence scanty, more pronounced towards caudal segments but never as prominent as in *L. crepusculum*; eighth abdominal segment bare, white.

Pupa (fig. 76, c): Length 9.5–11 mm., diameter 1.2–1.5 mm. Similar in colour and general appearance to *L. crepusculum*, differing as follows: size smaller. Antennal sheaths (fig. 76, d). Labrum (fig. 76, e) with truncate apex; labial lobes short, thick at origin, apices truncate; maxillary lobes thick at origin, tapering gradually to blunt points.

Pronotal breathing horns (fig. 76, c) not directed laterad, either parallel to one another or curving slightly inwards at apices, relatively longer than in *crepusculum*, cylindrical and uniformly wide for most of length (not tapering), slightly swollen at apices. Mesonotum armed with a low ridge (fig. 76, b) along anterior margin on either side of median line, apex of ridge subacute (lateral aspect), inconspicuous (dorsal aspect) with row of minute juxtaposed ridges, which tend to disappear on metanotum (fig. 76, c). Outer leg sheaths of male end opposite end of abdominal segment 3 (fig. 76, c); of female, of posterior annulus of same segment.

Abdominal armature comprised of short, broad, castellate spines (fig. 76, f), caudally directed. Actual arrangement as in *crepusculum*, with this minor difference: venter of posterior annuli (abdominal segments 4–7) with several scattered spines on mesal region, those on the last segment being more pronounced. Scabrous areas of abdominal segments and of the cauda not apparent, being either absent or concealed by the sand grains which are difficult to remove completely from the pupae.

Remarks.—Except for the shape of the antennae and of the ovipositor valves, it is wellnigh impossible to differentiate the females of this species from those of *crepusculum*. It is interesting to note that the left wing of one male possessed M_{1+2} unbranched; the right wing, however, had a small cell M_1 which was about one-fifth the length of its petiole.

At French Hoek Pass the adults of this species were found swarming on the edges of a marsh of saturated red ooze, the actual water being covered with an iridescent scum. This marsh occurred below the embankment of a road and was supplied by a small trickle of water

from a culvert. Empty pupal cases and one mature pupa were present on small raised mud spits near the upper drier regions of the marsh (October 1933).

In September 1934 several larvae and pupae were found by Mrs. Wood and the author in the same spot, the larvae being in the saturated mud beneath the water. Six imagoes were reared from these larvae.

Adults of *Tipula soror* occurred on the grasses in the middle of the swamp (October 1933). It is probable that the immatures of this species inhabit the saturated mud of the bog.

Limnophila venaguttula Alex.

Fig. 77.

1934. pp. 53-55 *Limnophila* (*Elaeophila*).

Length 6.2-6.8 mm., wing 7.2-8.4 mm. Coloration of body, venation and markings of wings fully described by Alexander. Antennae short, as long as entire head, 16-jointed, shape as in fig. 77, *c*. Wings (fig. 77, *a*) are illustrated for the first time.

Ninth tergite and sternite fused, forming a narrow ring, caudal margins almost straight. Basistyles moderately long, twice as long as broad, swollen basally, tapering gradually to blunt apices, inner basal angle produced into a short chitinised hook attached to mesal surface of aedeagus. Dorsal dististyle (fig. 77, *b*) a pubescent lobe, flattened and fleshy, wide basally, tapering to blunt apex; ventral dististyle (fig. 77, *b*) heavily chitinised, a flat blade, constricted slightly mesally, apical angle swollen, rounded, constricted suddenly and produced into a short, acute curved hook. Each gonapophysis short, rodlike, chitinised, acute apices produced dorsad, basal portion produced cephalad into the swollen "latera"; aedeagus shorter than gonapophyses, broad basally, tapering sharply to slender apex; "basum" a broad plate; penis undetectable.

Female ovipositor similar to that of *L. nox*.

Localities.—Cape Peninsula: nil.

Cape Province: Coldstream (Tucker), January 1921;
Harkerville Forest (G. A. W., H. G. W.), January
1937 and 1938.

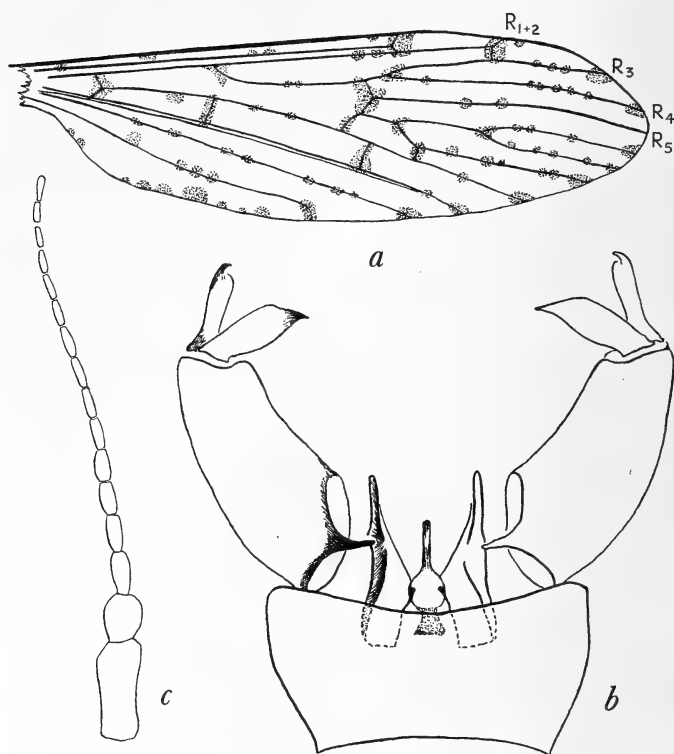


FIG. 77.—*Limnophila venaguttrula* Alex. a, wing; b, male hypopygium (dorsal view); c, antenna.

Genus *ELEPHANTOMYIA* Osten-Sacken.

1859. pp. 203, 220.

Imago.—Rostrum greatly elongated, from one-half to once the length of entire body; antennae usually 16-jointed; wings with Sc long, extending to mid-length of RS, frequently longer, ending opposite fork of RS; Sc_2 at tip of Sc_1 ; element R_{2+3} absent, R_2 absorbed by R_1 to form element R_{1+2} , vein R_3 atrophied, thus anterior branch of RS is vein R_4 , posterior branch is vein R_5 , thus only two branches of RS reach wing margin; cell M_1 absent; cell 1st M_2 closed; male hypopygium with two dististyles articulating with each basistyle; penis usually prominent and elongate; aedeagal sheath

with lateral chitinated projections bearing distad a stout chitinated gonapophysis and proximad a slender acute rod.

Larva.—Form slender, with silky pubescence. Abdominal segments 5–7 with ventral creeping welts or pads. Chaetotaxy nil. Spiracular disc lobeless or with four distinct lobes. Anal gills absent or four in number, short. Head capsule massive, of *Limonian* construction (*aurantiaca*) or composed of slender, elongate, narrow plates, not of *Limonian* construction (*montana*).

Pupa.—Frons produced into rostral sheath, short and semicircular or elongate, lying between fore femora, labial lobes at apex of this sheath. Antennal sheaths lie partly across eyes. Cephalic crest reduced, not conspicuous. Thorax convex; pronotal breathing horns lying flat against head, long, wide, or curved and bent, widely separated. Chaetotaxy short, surrounded by clusters of spines or unarmed. Eighth segment of cauda with a square of four lobelike spines.

The three species of *Elephantomyia* occurring in the S.W. Cape area have been reared, the immatures frequenting the following habitats:—

<i>E. aurantiaca</i>	{	In moss cushions in waterfalls or along edges of
<i>E. pseudosimilis</i>		
<i>E. montana</i>		In decaying logs.

The affinities of this genus have for many years been puzzling and obscure to many workers on Tipulidae. Until 1920 this genus was included in the tribe Limoniini (Alexander, 1919, p. 897); from 1920 to 1927, from a study of the immature stages, it was included in the tribe Eriopterini (Alexander, 1920*a*, p. 952). In 1927 (1927*b*, p. 53) Alexander cleared any doubts by stating that “veins R_3 and R_4 fused to the wing-margin, and the basal section of R_2 entirely atrophied”. Thus only two branches of RS attain the wing margin—a feature which is possessed only by the tribe Limoniini.

The study of the larval and pupal stages of *Elephantomyia* in the S.W. Cape has revealed that two distinct types of immatures exist:—

(a) *aurantiaca* type, which resembles the tribe Limoniini in head capsule and spiracular disc,

(b) *montana* type, similar to immatures of *E. westwoodi*, and thus of the typical structure found in the tribe Hexatomini.

In this paper, therefore, this genus is included in the tribe Hexatomini in accordance with recent work of Alexander (1927*b*, p. 53; 1931, p. 150; Curran, 1934, p. 46).

Key to Species of Elephantomyia.

Imagos.

- | | |
|--|------------------------|
| 1. Stripes on mesonotal praescutum | 2. |
| Mesonotal praescutum unspotted | <i>aurantiaca</i> . |
| 2. One dorso-median stripe on praescutum | <i>montana</i> . |
| Three stripes on praescutum | <i>pseudosimilis</i> . |

Larvae.

- | | |
|--|---------------------|
| 1. Head capsule massive, of <i>Limonian</i> type, individual mouth parts distinct, large; no oesophageal ridges; spiracular disc lobeless | <i>aurantiaca</i> . |
| Head capsule minute, with long, slender, rodlike plates; actual mouth parts minute, indistinct; oesophageal region surrounded by conspicuous, oblique, chitinated ridges; four lobes round the spiracular disc | <i>montana</i> . |

Pupae.

- | | |
|---|---------------------|
| 1. Breathing horns upright and conspicuous; rostral sheath of normal length | <i>aurantiaca</i> . |
| Breathing horns flat against head and inconspicuous, at first glance apparently absent; rostral sheath elongate, extending to base of fore femora | <i>montana</i> . |

Elephantomyia aurantiaca Alex.

Figs. 78, 79.

1917. p. 146, pl. x, fig. 8 (wing).

The holotype described by Alexander was in poor condition, the rostrum and the abdomen having been broken. Additional notes are as follows:—

Length (excluding rostrum): ♂ 5–6 mm., ♀ 8 mm.; wing: ♂ 5·8–5·9 mm., ♀ 6·7 mm.; rostrum: ♂ 3·5, ♀ 4·5 mm.

Wing (figured by Alexander): with Sc moderately long, extending to mid-length of RS, Sc₂ at tip of Sc₁ (not shown in Alexander's figure); RS six and a half times basal deflection of R₅; vein R₃ lost by atrophy, vein R₂ captured by R₁, thus only two branches of RS attain wing margin (*i.e.* veins R₄ and R₅); cell R₂ wider at margin than cell R₄ by one-quarter the width of the latter; cell R₄ thus somewhat divergent; cell 1st M₂ one and a half times as long as broad.

Abdomen similar in colour to thorax; dark markings absent.

Hypopygium (fig. 78, *a*): the sparsely haired ninth tergite is fused with ninth sternite forming a narrow ring, the caudal margin of the tergite being produced into a broad conspicuous membranous lobe, with microscopic pubescence and which normally conceals the underlying structures; posterior margin of ninth sternite ridged medially. Basistyles stout, sparsely haired; outer dististyle chitinised, broad at origin, tapering abruptly into slender rod, bifid apically; inner dististyle a fleshy pubescent lobe. The spirally twisted penis is prominent, protected basally by the enveloping aedeagal sheath, apex of which is produced into tapering projection. Basally the aedeagal sheath dilates, giving rise on either side to a chitinised support curved dorsad and bearing a proximad slender acute rod and the distad flat chitinised bladelike gonapophyses, apices of which are acute (fig. 78, *b*).

Rostrum one-half the length of the entire body.

Localities.—Cape Peninsula: Kasteels Poort (top) (H. G. W.), February 1933, January 1934; Orange Kloof (H. G. W.), January and March 1933, January 1934; Platteklip (K. H. B.), March 1933; Fernwood Ravine (C. W. T.), February 1934 and 1935.

Cape Province: Ceres (Lightfoot), April 1913; Landdrost (K. H. B.), March 1919; French Hoek Pass (K. H. B., H. G. W.), December 1933; Meirings Poort Spitzkop (C. W. T.), September 1935.

Larva.—Length 10–11 mm., diameter .8 mm. Colour golden-yellow due to the heavy pubescence of body; creeping pads inconspicuous. Body terete, form slender, abdominal segments 5–7 with a ventral creeping welt, which, although protuberant, is relatively inconspicuous against the body colour; no welts on remainder of body.

Chaetotaxy nil.

Ultimate segment of abdomen produced dorsally into a small spiracular disc (fig. 78, *e*), which is lobeless and unmarked. Spiracles small, oval, placed close together, capable of approximation under water in times of torrential rains. Anal gills four, short, bluntly rounded.

Head capsule massive, retractile, of *Limonian* type. Antenna (fig. 78, *c*) bi-segmented, first segment twice as long as broad, cylindrical, apex slightly swollen, second segment not buttonlike but elongate, *i.e.* three times as long as broad, base surrounded with the usual three to four minute papillae. Mandible massive, with two apical teeth and three ventral cutting teeth, the last tooth truncate. Maxilla: outer lobe covered with dense elongate hairs, apex bearing

a distinct flattened palpus with four to six minute pegs; inner lobe fleshy, densely pubescent. Labrum as in genus *Limonia*. Hypopharynx of two plates, dorsal with six blunt teeth, ventral plate often having the teeth worn, the stumps of six visible. Mentum (fig. 78, *d*)

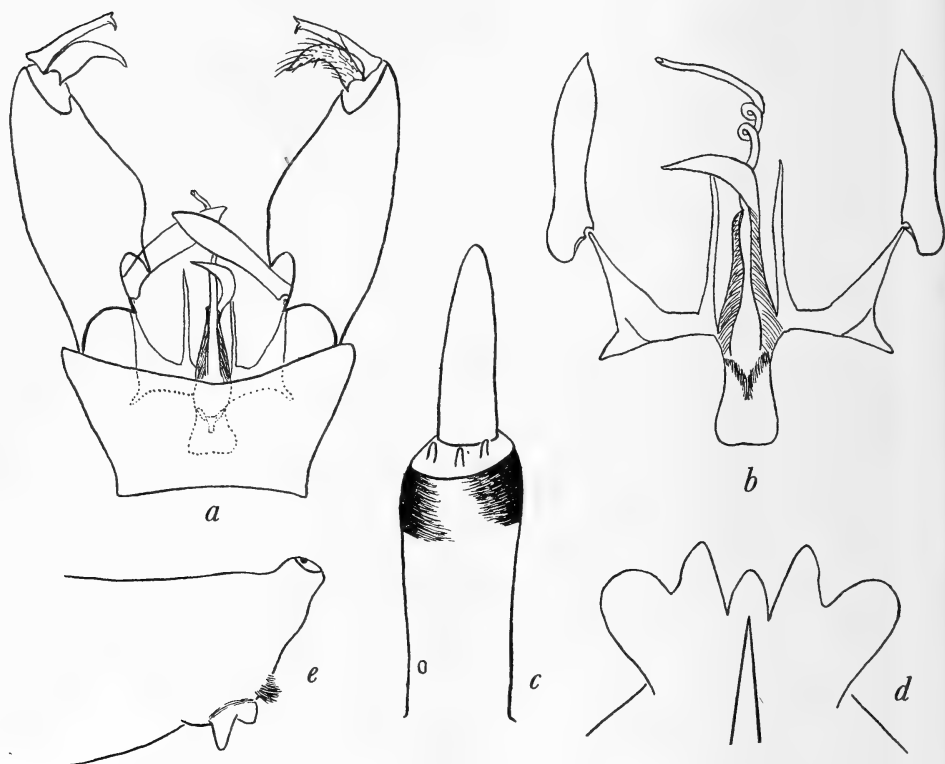


FIG. 78.—*Elephantomyia aurantiaca* Alex. *a*, male hypopygium (dorsal view); *b*, penis and aedeagal structures (dorsal view). Larva: *c*, antenna; *d*, mentum; *e*, end of abdomen (lateral view) with anal gills and spiracular disc.

conspicuous, anterior margin with a median tooth, on either side a larger and broader tooth, laterad of this tooth a prominent, broad, almost circular tooth.

Pupa.—Length: ♂ 6 mm., ♀ 7–8 mm.; diameter: ♂ .8 mm., ♀ 1 mm. Colour rich yellowish brown; thorax and breathing horns dark brown; wing pads and legs blackish brown.

Cephalic crest reduced, merely two minute setiferous tubercles. Antennal sheaths (fig. 79, *a*, *c*) lying partly across eyes, stout at their origin, curved from mesal region, tapering to slender apices. Frons

produced into slight rostral sheath, of normal length, constricted slightly before the semicircular apex; maxillary palpi slender, tapering abruptly to slender apices; labial lobes at apex of rostral sheath, bluntly rounded (fig. 79, *b*).

Thorax convex, with a deep transverse pronotal groove; breathing horns (fig. 79, *a*) stout, sharply bent at origin, then slender, curved, widely separate, tracheal tube visible, especially at origin. Postnotum has transverse row of six setae, praescutum two mesal median setae.

Abdominal segments subdivided into two narrow basal annuli and a broad posterior annulus (fig. 79, *d*). Traces of a spiracle on segment 7 only. Entire abdomen densely covered with acute microscopic spines; on sternite 7 and on cauda these are concentrated round the setae giving the effect of a raised cluster of five to seven spines. On the pleurite of segment 7 three to five spines are clustered round mesal and posterior setae. Chaetotaxy: tergites 3-7 and sternites 5-7 (posterior annuli) with transverse row of six to eight large evenly spaced setae near posterior margin and a similar row across the mesal region; sternites 3-4 with a pair of setae on either side of leg sheaths; tergites 1-2 have posterior row of setae only; pleura with four setae, one anterior, a mesal pair, and one posterior. Wing pads extend to opposite end of abdominal segment 2; leg sheaths of female opposite end of segment 4; of male, end of segment 5.

Female cauda (fig. 79, *g, h*): Both pairs of sheaths long, practically of similar length, each tergal sheath with apical dorsal swelling bearing a sharp chitinised spine, cephalad of which is a pair of medial setiferous tubercles; a conspicuous dorsal square of four spined lobes near origin of sheath; laterad of cephalad angles of square clusters of bifid spines around each seta.

Male cauda (fig. 79, *e, f*): Tergal sheaths produced apically into a spined swelling; sternal sheaths larger, wider, each sheath with large, outer, spined swelling and a smaller inner protuberance; armature of cauda as in female.

Remarks.—Dr. Barnard first bred two adults from pupae collected in a cushion of moss and liverworts on a waterfall in Platteklip (November 1933).

At French Hoek Pass Dr. Barnard and the author secured six larvae in moss on a small cascade eight feet in height. Due to the time of the year and the high gradient of this stream, little water was present, the moss being merely damp. In time of torrential rains it is probable that the larvae migrate towards the safer areas on the bank of the stream. One adult was bred out by Dr. Barnard.

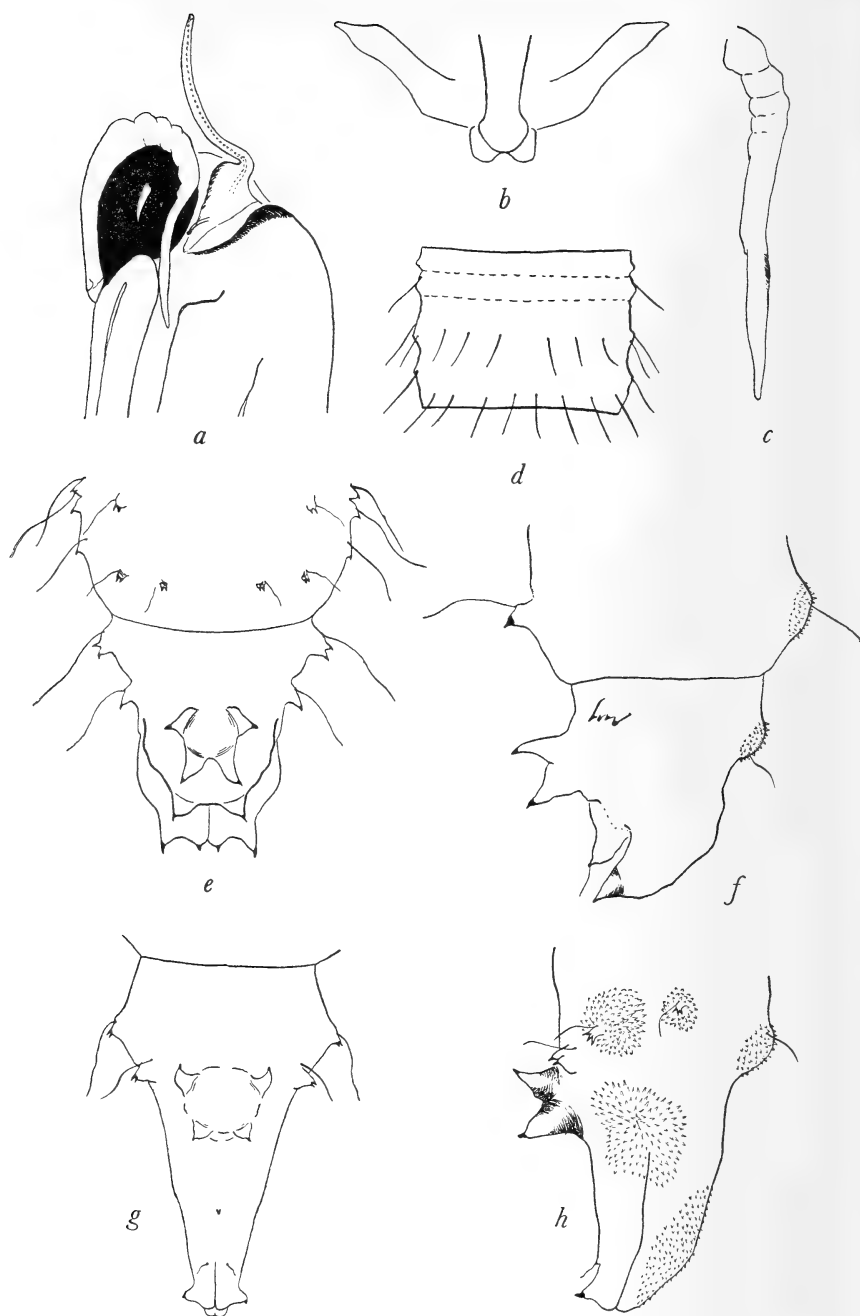


FIG. 79.—Pupa of *Elephantomyia aurantiaca* Alex. a, head and thorax (lateral view); b, rostral sheath and mouth parts; c, antennal sheath; d, fifth abdominal segment (ventral view); e, male cauda (dorsal view); f, male cauda (lateral view); g, female cauda (dorsal view); h, female cauda (lateral view).

Larvae collected by Mr. Thorne at Fernwood (February 1935) were found in the wet, sandy, moss-covered soil on the extreme edges of the forest rill. Pupation occurs towards the drier regions of the bank.

A striking feature of this pupa is the reduction in the length of the rostral sheath. In the imago the rostrum is one-half the length of the entire body. (The pupa of *E. montana*, by way of contrast, has the rostral sheath long, extending to base of swollen fore femora.)

The larva of this species has a head capsule of *Limonian* construction, resembling that of *Limonia sexocellata*, and differing from it only in the armature of the mentum and in the antennae.

Elephantomyia montana Alex.

Figs. 80, *a*; 81.

1934. pp. 56–57 (*E. wahlbergi montana*).

♂: Length (excluding rostrum) 5–6 mm., wing 6.4 mm., rostrum 5 mm. Additional notes to Alexander's figureless description are as follows:—

Rostrum black, greatly elongated, practically as long as entire body. Wings (fig. 80, *a*) with Sc ending opposite fork of RS; Sc₂ at tip of Sc₁ and equal in length; RS strongly arcuated at origin, four times basal section of R₅; vein R₄ slightly sinuous at mid-length, running parallel to R₅, cell R₄ thus not divergent; cell 1st M₂ one and a half times as long as broad.

Hypopygium (fig. 81, *a*) resembles that of *E. aurantiaca*, differing thus: the more cup-shaped aedeagal sheath having antero-lateral corners prominently produced caudad to carry the flat, chitinated, bladelike gonapophyses which are bluntly rounded apically. Penis short, hardly extending beyond tips of proximad structures. Basistyles slightly shorter and stouter.

Localities.—Cape Peninsula: Fernwood (C. W. T.), December 1934, January 1935; Window Gorge (C. W. T.), October 1934.

Cape Province: Oudebosch (Lightfoot), December 1920; (G. A. W., C. W. T., H. G. W.) September 1937; (C. W. T., H. G. W.) September 1933.

Larva.—Length 12 mm., diameter .8–1 mm. Colour rich golden-yellow due to the silky appressed pubescence; creeping welts darker yellow.

Body terete, form slender, tapering towards either end but more abruptly anteriorly, head capsule often protruding as a sharp narrow point; abdominal segments gradually increasing in length to the fourth and fifth, then gradually decreasing in length; abdominal segments 5-7 with basal transverse, mouthlike, creeping fold of microscopic scurfiness, each well margined with short stiff hairs.

Chaetotaxy nil.

Spiracular disc (fig. 81, c) devoid of inner markings, surrounded by four lobes, fringed with short yellow hairs, dorso-lateral pair of

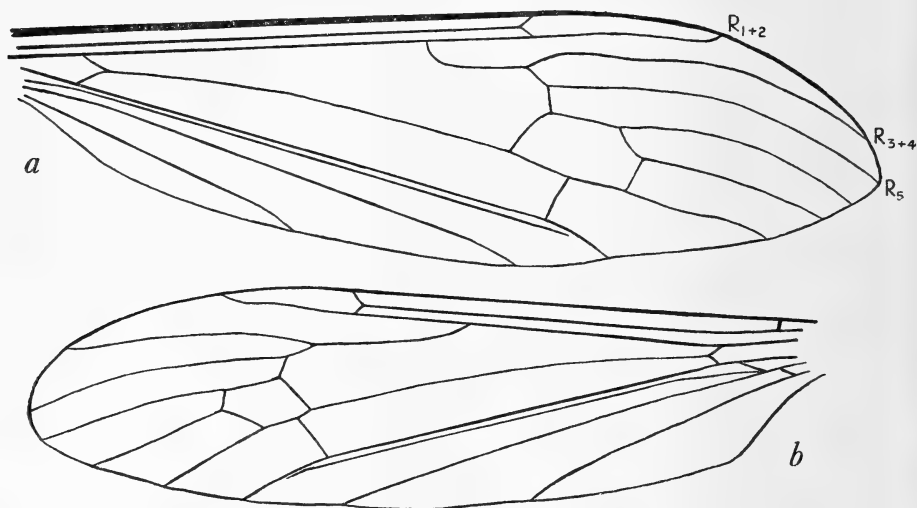


FIG. 80.—a, *Elephantomyia montana* Alex.; b, *Elephantomyia pseudosimilis* Alex.

lobes smaller than the ventral pair, the oval spiracles at base of former lobes being separated by four times the longer diameter of one spiracle. Anal gills absent; the transverse slitlike anus surrounded by dense yellow hairs (fig. 81, b).

Head capsule small and narrow, the three plates elongate, narrow, slender, rodlike, dilated apically. The prominent antennae bi-segmented, basal segment short, cylindrical, second segment large, three to four times the basal, suboval. Oesophageal region strengthened with oblique parallel ridges of chitin, producing a latticed effect. The dense long hairs of the labrum and maxilla render the details of the rest of the head capsule difficult to detect. Mandible evidently minute, not distinguishable even after dissection.

Pupa (fig. 81, *d*).—Length 6 mm., diameter 1.2 mm. Unicolourous, a dark yellowish brown.

Between eyes a ridge with slight transverse crest, in front of which and immediately proximad of origin of each antennal sheath a stout seta, further cephalad a pair of long setae on frons, behind each antennal base a long tuberculous seta. Antennal sheaths (fig. 81, *d*, *e*) lying across eyes, stout at origin, wrinkled mesally, then dilated and tapering to slender pointed apices. Frons broad at origin, produced into a prominent elongate rostral sheath lying between the swollen fore femora; near apex of sheath lie the maxillary palpi, which are dilated at origin, and taper gradually to slender acute apices; labial palpi small, rounded, at apex of rostral sheath. At each junction of eye and rostral sheath a prominent wartlike tubercle.

Thorax convex. Pronotal breathing horns directed cephalad, lying flat against head, long, wide, bluntly rounded apically (fig. 81, *d*, *f*). Laterad of each horn two outer and three inner setae. Postnotum with transverse row of six setae. Wing pads extend to end of segment 3, leg sheaths opposite end of segment 5, 6 or 7 in male.

Abdominal segments 2–6 subdivided into two annuli, anterior annulus extremely narrow, posterior annulus broad. Entire abdomen densely covered with acute microscopic spines, no concentrations or clusters of spines around the setae on segment 7 and the cauda. Chaetotaxy as in *E. aurantiaca*, the setae somewhat more conspicuous against body shading. Spiracles on pleura 2–7 ringed with dark brown or black; conspicuous against body colour (fig. 81, *d*).

Remarks.—Mr. Thorne first bred this species from larvae collected in a decaying log at Fernwood Ravine (January 1935).

In a fallen log of *Halleria capensis* over a forest stream were found larvae and pupae by Mrs. Wood, Mr. Thorne and the author (Oudebosch, September 1937). They occurred with the immatures of *Limonia subapicalis* Alex., both species being in the saturated rust-coloured scum beneath the crumbly bark. The fully grown larvae burrow or eat their way for a distance of three-quarters of an inch until they are immediately beneath the epidermis of the tree. Here they pupate; duration of pupal stadium six to seven days (minimum). The mature pupae wriggle vigorously until the body as far back as the ends of the tarsal sheaths projects out of the burrow. After a long and sustained effort, accompanied by much swaying to and fro, the imagos split the pupal case along the thorax and emerge, leaving the “shuck” protruding from the log.

The immatures of this species closely resemble those of the North

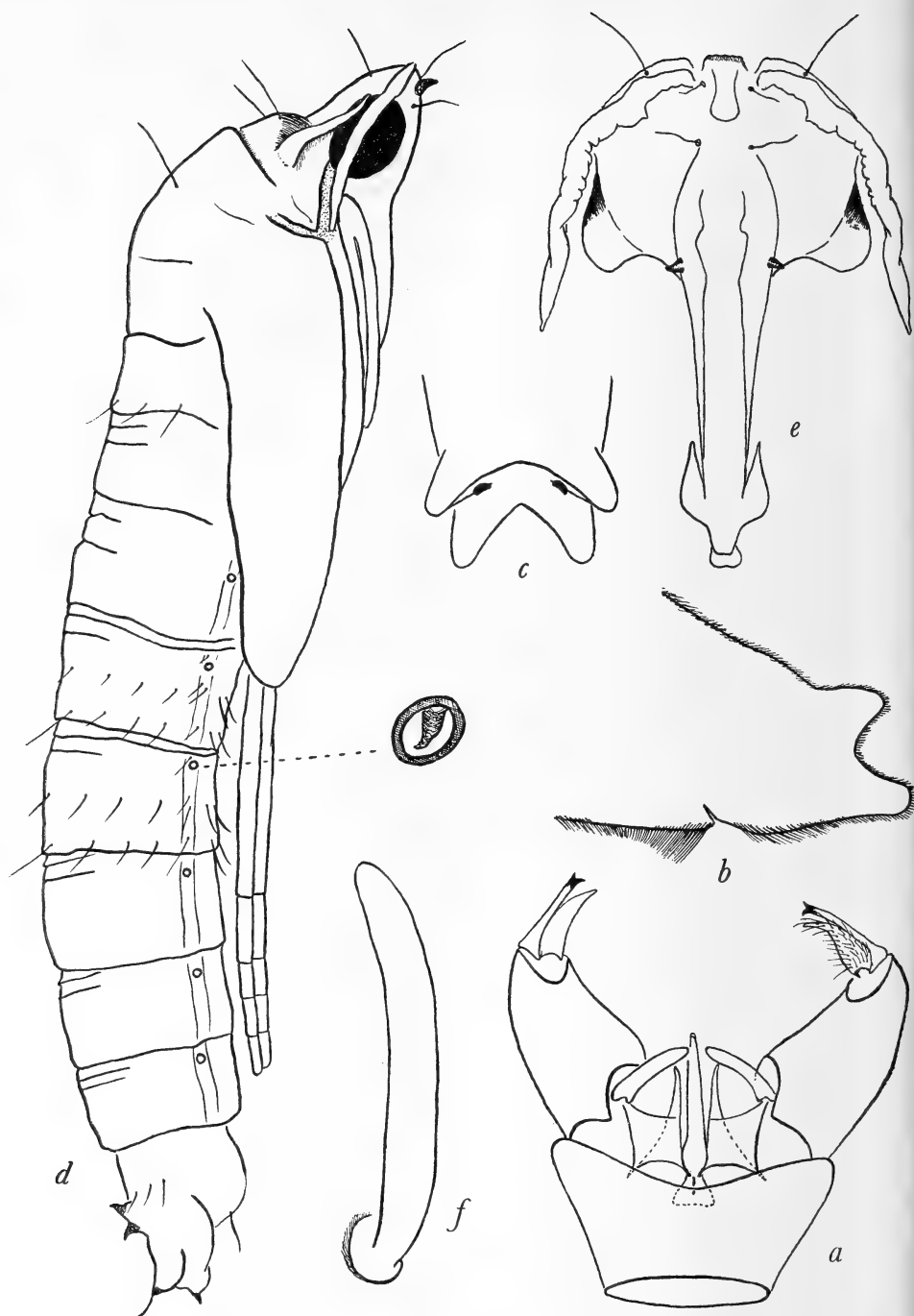


FIG. 81.—*Elephantomyia montana* Alex. Imago: *a*, male hypopygium (dorsal view). Larva: *b*, end of abdomen; *c*, spiracular disc (dorsal view). Pupa: *d*, side view; *e*, rostral sheath and mouth parts; *f*, pronotal breathing horn.

American genotype *E. westwoodi* O. S. (Alexander, 1920a, pp. 953-955).

Elephantomyia pseudosimilis Alex.

Fig. 80, b.

1921. pp. 188-189 (*E. insularis pseudosimilis*).

Alexander described the holotype in detail, but the abdomen was missing; from the following measurements it was obviously a female.

Length: ♀ (excluding rostrum) 9·2 mm., wing 7·8 mm., rostrum 6·5 mm. Length: ♂ 5·5-6 mm., wing 5·8-6·2 mm., rostrum 4·4-2 mm.

Rostrum dark brownish black, three-quarters the length of entire body. Wing (fig. 80, b) with Sc_2 at tip of Sc_1 , one-half the length of Sc_1 , ending opposite three-quarters the length of RS; cell R_4 slightly divergent, one-half the width of cell R_2 at wing margin.

Abdomen slightly lighter than thoracic ground colour. Hypopygium closely allied to that of *E. aurantiaca*, differing as follows: basistyles shorter and stouter, without the double notch on inner anterior margin. Extreme tip of basistyle is pointed and has numerous small black spines on inner margin immediately anterior to tip. Penis long, slender and curved backwards, enclosed in a sheath which possesses no hooklike structure at tip. Gonapophyses pick-shaped.

Localities.—Cape Peninsula: Kasteels Poort (K. H. B.), October 1932; Echo Valley (H. G. W.), March 1932.

Cape Province: Zwartberg Pass (K. H. B.), February 1932; Michell's Pass (C. W. T., H. G. W.), October 1934; Oudebosch (K. H. B.), January 1919.

Remarks.—An adult of *E. pseudosimilis* was bred from a single larva collected at Michell's Pass (October 1934). Consequently the larva cannot be described. The pupa closely resembles that of *E. montana* in general appearance, but differs vastly in the type of habitat (see Ecological Table, p. 241). Duration of pupal stadium: seven days (minimum).

Genus ATARBA Osten-Sacken.

1869. p. 127.

Imago.—Rostrum short; wings unspotted; generic composition of wing as described under description of species; male hypopygium

not of *Limonian* construction; basistyles long, each bearing two dististyles; penis elongate, strongly curved ventrad and then dorsad; ovipositor acicular, elongate, of normal construction.

This genus is represented in the S.W. Cape by one species. The immature stages are still unknown.

Atarba capensis Alex.

Fig. 82.

1917. pp. 147-148, pl. x, fig. 10 (wing).

1921. p. 187.

Length 4.4-4.7 mm., wing 5.1-5.6 mm. General coloration dull yellow. Antennae missing from holotype.

Wings (fig. 82, *a*) without stigma; Sc short, ending beyond origin of RS by a distance equal to Sc_2 ; Sc_1 two to three times length of Sc_2 , ending opposite one-half the length of RS; RS short, arcuated, two and a quarter to two and a half times m-cu; two branches of RS reach wing margin (*i.e.* veins R_4 and R_5), as veins R_2 and R_3 have been captured by R_1 to form R_{1+2+3} ; R_4 one and a half times RS; cell R_4 broad, slightly divergent apically; cell M_1 absent; cell 1st M_2 closed, broad; m-cu at fork of M.

Abdomen uniformly brown; a black ring prior to hypopygium. Male hypopygium (fig. 82, *b*) with ninth tergite narrow, caudal margin widely cleft by a median notch. Basistyles long, two and a half times as long as broad, pubescent, tapering slightly to apical notch which bears the two dististyles: dorsal dististyle a chitinised curved blade, outer margin hooked and armed with eight to ten acute, blackened spines; ventral dististyle a fleshy pubescent lobe, tapering to slender apex. Gonapophyses short, stout, wide basally, forming a broad open structure around mid-length of aedeagal sheath, each caudal surface prolonged into a broad concave lobe, apex rounded; outer basal angle produced into a chitinised rod or strip connected to inner basal angle of basistyle. Aedeagal sheath long and slender; penis elongate, projecting, strongly curved ventrad and then dorsad, apex funnel-shaped, with crenulate margins.

Localities.—Cape Peninsula: nil.

Cape Province: Landdrost (K. H. B.), 1915; Knysna (Peringuey), October 1916.

Remarks.—Rogers (1927, pp. 1-7), from a study of the immatures, indicated that this genus might be a member of the tribe *Limoniini*,

being allied to the American *Dicranoptycha*. Thus the affinity of *Atarba* remains unsolved and puzzling, for it is allied to the genus *Rhabdomastix*. This latter genus has been placed without doubt in the tribe Eriopterini. In the S.W. Cape the type of male hypopygium

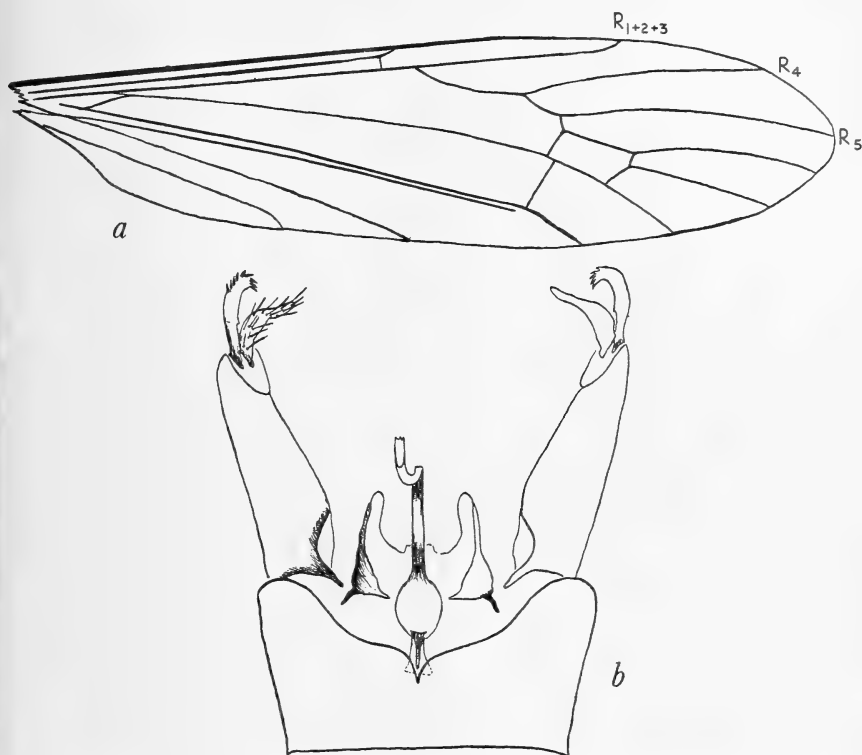


FIG. 82.—*Atarba capensis* Alex. *a*, wing; *b*, male hypopygium (dorsal view).

found in *Atarba* is not that found in the tribe Limoniini, but agrees with that of the tribe Eriopterini and Hexatomini.

Genus CONOSIA van der Wulp.

1880. p. 159.

Imago.—Rostrum short, not exceeding rest of head; antennae 12-jointed; wings with Sc terminating distad to fork of RS; RS elongate, almost straight, about four to four and a half times m-cu; three branches of RS attain wing margin; cell R_3 very deep; R_2

reflexed back at basal section, consequently proximal end of cell R_2 is acutely pointed; cell 1st M_2 present; cell M_1 present; thoracic praescutum produced over pronotum; in male hypopygium basistyles are stout but long, bearing two dististyles apically. Ovipositor of normal *Tipuline* composition.

Larva.—Body slender, terete. Spiracular disc surrounded by four lobes, ventral pair twice the length of lateral pair, fringed with long hairs. Anal gills short, stout. Head capsule very dissected. Mandible massive, tip produced into an acute sickle-shaped apex; cutting-edge with a solitary truncate tooth. Maxilla with base chitinised, apical portion elongate, hyaline, bearing three minute papillae. Antenna unsegmented, elongate, apex with a large papilla, two to three papillae and an elongate seta. Mentum heavily chitinised, consisting of two lateral rods and a transverse bar.

Pupa.—Body elongate, slender. Cephalic crest absent. Mouth parts irregular in outline, truncate apically. Thorax convex; breathing horns large, tubular basally, directed ventrad towards head sheath, apices dilated into wide pores, edges annulate. Chaetotaxy nil. Abdominal segments armed with longitudinal rows of blackened spines. Pleura with spiracle near anterior margin on a raised rounded protuberance. Sternal sheaths bearing an acute spine apically, in male longer than tergal sheaths, in female shorter than tergal sheaths; eighth segment of cauda with a square of four lobes lying flat against surface of that region of cauda.

This genus is represented in the S.W. Cape by the cosmopolitan species, *Conosia irrorata*. The immature stages are to be found in the wet gravelly sand and red silt on the margins of streams.

Conosia irrorata (Wiedemann).

Figs. 83–85.

1828. p. 574 (*Limnobia irrorata*).

1848. Walker, p. 39 (*Limnobia substituta*).

1857. Doleschall, p. 388 (*Limnophila crux*).

1880. v. d. Wulp, p. 159.

1917. Alexander, p. 154.

1921. *Id.*, p. 203.

1927b. *Id.*, p. 54, fig. 33 (radial field of wing).

Wiedemann's description (1828, p. 574) of this species is meagre. Additional notes are as follows: antennae (fig. 83, *b*) with the first

scapal joint two and a half times as long as broad; scapal joint 2 large, globular; flagellar joint 1 subequal, globular; joints 2-4 less globular, increasing in length; joints 5-9 fusiform; ultimate joint longer than previous joint.

Wings with distribution of clouds and spots as in fig. 83, *a*; Sc long, ending opposite fork of RS; Sc₂ absent; RS long, *i.e.* four to five times m-cu; cell R₃ consequently long and narrow; R₄ in alignment with RS; R₂₊₃ emerges from RS at right angles and is bent again at right angles at its forking into R₂ and R₃; R₂ reflexed back at basal section so that the proximal end of cell R₂ is acutely pointed; R₁₊₂ slightly sinuous towards wing margin; R₂ meeting R₁ before tip of Sc by its own length; cell M₁ one and a half times its petiole; cell 1st M₂ acute proximad, divergent distad.

Eighth sternite of abdomen elongate, projecting beyond the eighth and ninth tergites. Male hypopygium (fig. 83, *c*) with caudal margin of ninth tergite produced, slightly concave medially; ninth sternite a narrow sclerite concealed normally by the eighth sternite. Basistyles stout, somewhat swollen basally, pubescent. Outer dististyle chitinised, narrow, apex hooked, bearing several acute spines; inner dististyle a fleshy pubescent lobe. Basal inner margin of each basistyle connected to the aedeagus, the dorsal margin of this pubescent connection heavily chitinised and contiguous ventrally beneath the aedeagus. Aedeagus bears two elongate, slender, acicular rods produced cephalad into two "latera," which are apparent through the ninth and part of the eighth segments when in normal position. Tubular portion of penis definite, tapering apically, short (fig. 83, *d, e*).

Localities.—Cape Peninsula: nil.

Cape Province: Seven Weeks Poort (K. H. B., C. W. T., H. G. W.), January 1935.

Zululand and Damaraland (Alexander, *l.c.*).

Larva.—Length 16-20 mm., diameter 1-1.3 mm. Colour dull cream, integument with appressed golden-yellow pubescence which on ultimate segment is especially pronounced, coarser and more erect.

Body slender, terete, a marked constriction between the penultimate and ultimate segments, the latter segment narrower than previous one. Posterior margins of each abdominal segment elevated into a transverse ridge of hairs. Abdominal segments 2-7 divided into two annuli, anterior annulus narrow, bearing on abdominal segments 5-7 a dorsal and a ventral transverse cushion of numerous juxtaposed

rows of coarse microscopic hairs; a mere suspicion of such cushions on abdominal segments 2-4.



FIG. 83.—*Conosia irrorata* (Wiedemann). *a*, wing; *b*, male antenna; *c*, male hypopygium (dorsal view); *d*, *e*, aedeagal sheath, gonapophyses and penis (dorsal and ventro-lateral views).

Chaetotaxy composed of tufts of a few stiff setae, the more conspicuous of these being situated as follows: thoracic segments and abdominal segment 1 with two dorsal and two ventral tufts near mesal region, one tuft at mid-pleural region. Abdominal segments

2-7 with two dorsal and two ventral tufts near mesal region on the posterior annuli; one pleural tuft on anterior annulus, one on mid-pleural region of posterior annulus. Abdominal segment 7 with two to three additional tufts near posterior margin of tergum and sternum.

Spiracular disc (fig. 84, *a, b*) surrounded by four lobes, the ventral pair long, slender, fingerlike, twice the length of lateral lobes, fringed with long delicate hairs, those at the apices becoming very long. There is a tendency for four to six hairs to congregate together to form several groups of hairs around the apex of each lobe. Apical hairs of lateral lobes are four to five times the length of the lobes, those on the ventral lobes with length of eight to ten times. Inner face of ventral lobes with a blackish-brown longitudinal stripe on either side of the yellowish median vitta, the dorsal stripe wider than the ventral, with a faint arcuate line extending across the spiracular disc to near the spiracles, inner face of the lateral lobes with a black crescent at apex. Spiracles small, light brown, separated by one and a half times the diameter of a single spiracle. Anal gills four, white, stout, short, ovate. Anterior to them is a prominent ventral fringe of long stiff hairs, ventrally directed; laterad to posterior pair are numerous pencils of stiff hairs, some directed cephalad, some ventrad.

Head capsule (fig. 84, *e*) very dissected, consisting of four membranous plates, dorsal pair margined by a heavily chitinised rod, pronounced at cephalic end and produced inwards, the anterior margin indented, providing an articulation socket for the base of mandible; lateral pair of plates convex, margined by a narrow rod of chitin, articulating ventrally with the caudal ends of the lateral rods of the mentum and dorsally at the area of heavy chitinisation of the capsule. Antenna (fig. 84, *c*) apparently unsegmented, elongate, slender, swollen basally, apex bearing a large elongate-conical papilla, sculptured basally, and two to three minute papillae in addition to an elongate seta about one-half the length of the antenna. Mandible (fig. 84, *d*) massive, powerful, heavily chitinised, deep at base, produced into an acute sickle-shaped apex, cutting-edge at mid-length with a solitary truncate tooth, basad of which the edge is finely serrate for a short distance. Maxilla (fig. 84, *e*) with base chitinised, this chitinisation abruptly narrowed at origin of outer hyaline lobe, continued up along outer margin of lobe as a narrow rod to apex which bears two to three minute papillae. Labrum (fig. 84, *f*) broad, postero-lateral corners rounded; dorsal surface chitinised, each antero-lateral corner produced into a truncate cone bearing two to

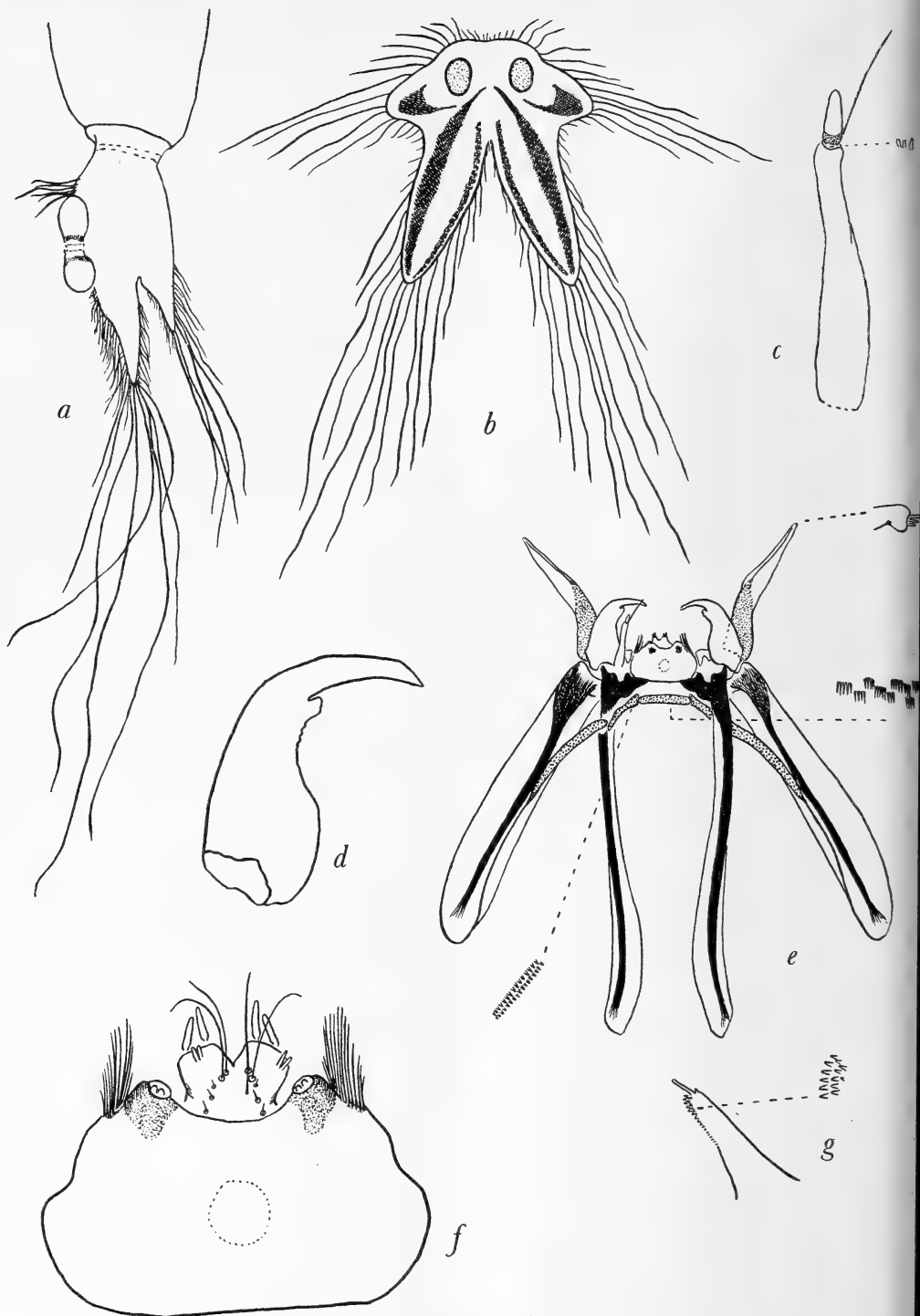


FIG. 84.—Larva of *Conosia irrorata* (Wiedemann). *a*, end of abdomen (lateral view); *b*, spiracular disc; *c*, antenna; *d*, mandible; *e*, head capsule (dorsal view); *f*, labrum (dorsal view); *g*, papilla on mental transverse bar.

three minute papillae; laterad of each cone a brush of numerous stiff setalike hairs. Anterior margin of labrum is produced into two truncate dilations confluent medially, each bearing apically two hyaline conical papillae; dorsad and laterad two additional smaller papillae, on surface of these dilations are two rows of five setae, those situated anteriorly being elongate, the three caudal setae being short. Mentum a heavily chitinated transverse bar, ungrooved, articulating with the lateral rods. Anterior and dorsad to the mental transverse bar is a pair of elongate papillae (apparently attached to the cephalic margin of bar—the actual attachment difficult to determine), each papilla as in fig. 84, *g*. Caudad to the transverse bar and on either side of the lateral rods of mentum, arising probably from the oesophageal surface, occur numerous groups of acute spines, directed caudally, each group composed of three to eight spines.

Pupa (fig. 85, *a*).—Length 12–13 mm., diameter 1–1.2 mm. Colour medium cream, mature pupae dark brown, eyes black. Body elongate, slender. Cephalic crest absent. Antennal sheaths (fig. 85, *a*) broad and square basally, suddenly constricted and tapering to slender narrow portion for the flagellar joints, terminating at insertion of wing pad. Labrum (fig. 85, *b*) broad, tapering to irregular truncate apex, labial lobes bent at mid-length, produced caudally into truncate apices. Maxillary palpi short, broad basally, produced slightly into rounded apices.

Thorax convex. Pronotal breathing horns (fig. 85, *a*, *c*) large and conspicuous, tubular basally, dilated apically into prominent wide pore, inner surface of which is concave, margins divided into numerous narrow annuli, continued along dorso-lateral surface as a double annulate stripe. Wing pads extend to end of abdominal segment 3; leg sheaths opposite end of segment 3; tarsi the same length.

Chaetotaxy nil.

Abdominal segments not subdivided into annuli but with numerous transverse wrinkles on majority of segments. Dorsa of segments 2–7 and venter of segments 3–7 armed with numerous acute, blackened, caudally directed spines, arranged in transverse row of six spines along anterior margin and three longitudinal rows of ten to fifteen spines, those of the mesal longitudinal row smaller than those in lateral rows. Pleura 2–7 with larger, conspicuous, acute, single spine near posterior margin. Venter of abdominal segment 3 with the mesal row of spines missing, its position being occupied by the ends of the tarsal sheaths. Pleura 3–7 with an anterior spiracle at the apex of a prominent raised rounded protuberance.

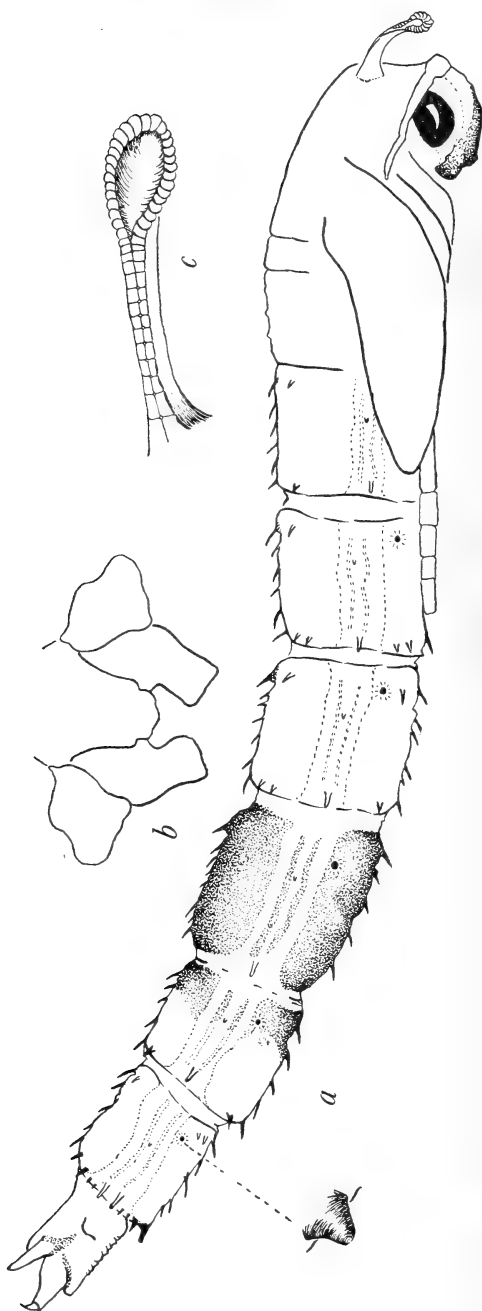


FIG. 85.—Pupa of *Conosia irrorata* (Wiedemann). *a*, lateral view ♂; *b*, mouth parts; *c*, pronotal breathing horn.

Male cauda with sternal sheaths longer than tergal sheaths, bearing an acute chitinated spine apically; eighth segment of cauda with a square of four large fleshy lobes, directed caudad and lying flat against the raised surface of this region of cauda, the lobes tapering gradually to blunt round tips.

Female cauda armed on eighth segment as in male, sternal sheaths short, one-half the length of the tergal sheaths, latter elongate, contiguous medially, rounded apically, bearing acute spine as in male.

Remarks.—Seven Weeks Poort yielded the first record in the S.W. Cape area for this widespread species (January 1935), "which has a tremendous range throughout the tropics and warm temperate regions of the Old World" (viz. localities: Alexander, 1923, pp. 11–12).

The adults occurred in a locality similar to that described by Munro (Alexander, 1923, p. 12): ". . . I have not found it numerous among trees and bushes, but the localities it especially favours are along small streams away from trees. Here it often occurs in great numbers among the rank grass, the more so when the stream or 'spruit' is in a furrow caused by water erosion and hence is more or less protected from the wind."

Many fully grown larvae were found in the wet sandy gravel and reddish silt on the edge of a small trickle of water two to three inches in depth. The dark mature pupae and empty "shucks," to which grains of mud adhere persistently, were present in the drier regions of the low bank. Several adult flies were bred from these larvae.

An adjacent portion of the stream yielded the immatures of *Tipula pomposa* and of *Gonomyia sulphurelloides*.

Genus TEUCHOLABIS Osten-Sacken.

1859. pp. 203, 222.

Imago.—Rostrum short, not exceeding rest of head; antennae 14-jointed; Sc moderately long, ending opposite mid-length of RS; Sc_1 equal to Sc_2 ; RS gently arcuated, two and a half times m-cu; two branches of RS reach wing margin, being subparallel, vein R_{2+3+4} present, three-quarters the length of vein R_4 ; R_2 enters R_1 before tip by a distance equal to its own length; cell M_1 lacking; cell 1st M_2 present, broad; veins 1A and 2A straight. Male hypopygium with short basistyles bearing two elongate and elaborate dististyles (whence generic name is derived).

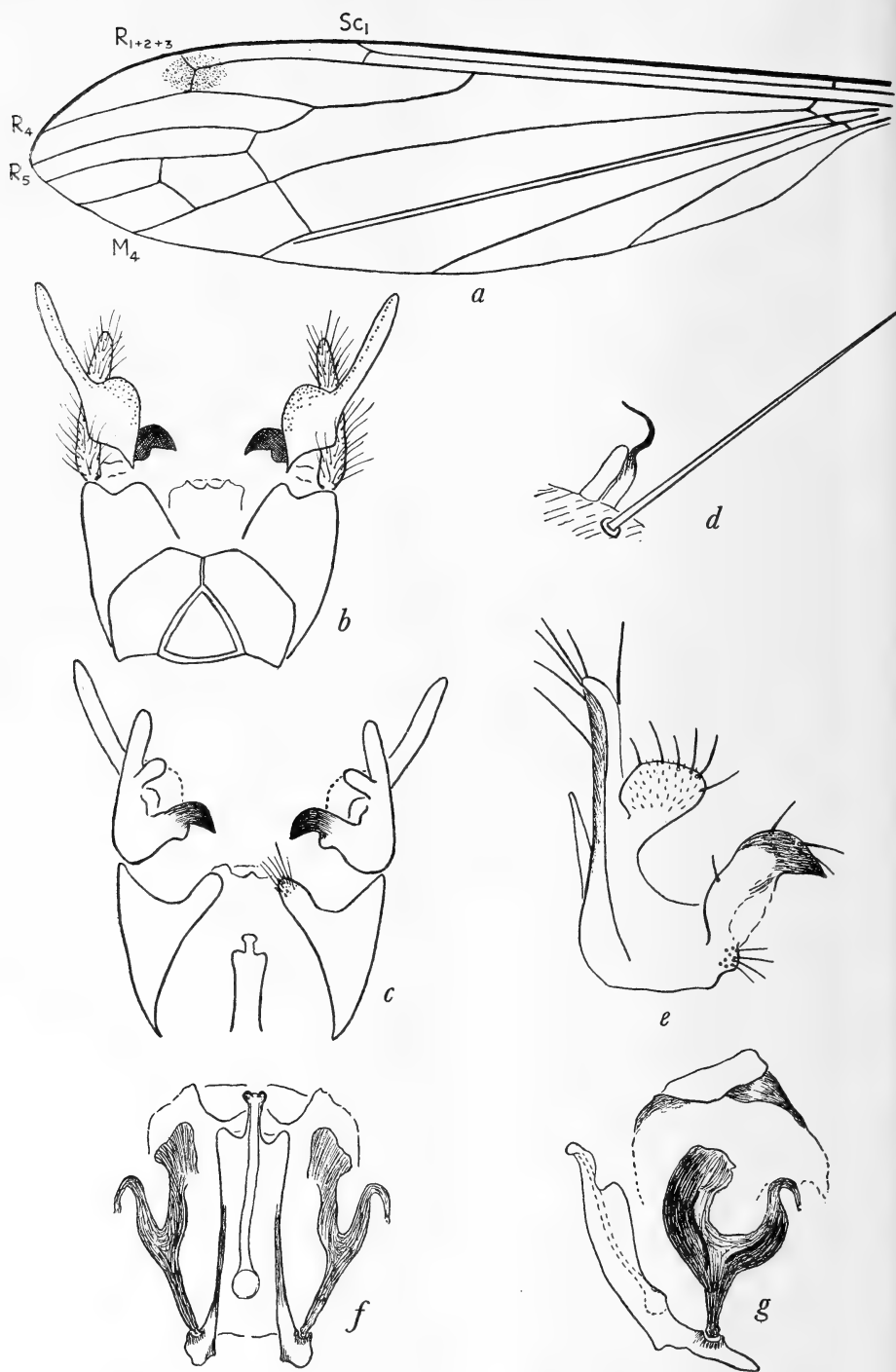


FIG. 86.—*Teucholabis nova* sp.n.: *a*, wing; *b*, male hypopygium (dorsal view); *c*, male hypopygium (ventral view); *d*, spines and seta of dorsal dististyle; *e*, ventral dististyle; *f*, *g*, aedeagal sheath and penis (ventral and lateral views).

This genus is represented in the S.W. Cape by a single species, *T. nova* sp.n., described herein. The immature stages are as yet unknown from this region.

Teucholabis nova sp.n.

Fig. 86.

♂: Length 5·5 mm., wing 5·5–6 mm. Head blackish brown; rostrum, palpi and antennae light brownish yellow; eyes black.

Antennae moderately long, two and a half times the head and thorax, clothed with short pubescence and odd, stiff, basal verticils, 14-jointed; scapal joint 1 cylindrical, twice as long as broad; scapal joint 2 subglobular, slightly longer than broad; flagellar joints 1–2 as broad as previous joint, one and a half times as long as broad, short and broadly fusiform; remaining joints gradually becoming slightly longer but more slender, thus being fusiform; ultimate joint longer than previous joint, considerably narrower, being five times as long as broad.

Prothorax pronounced, light brownish yellow, prolonged into an elongate slender neck. Thorax light brownish yellow, with faint indications of three darker brown stripes on mesonotal praescutum; pleura similarly coloured, with a wide and distinct dark brown stripe extending from prothorax to base of halter. Wings (fig. 86, *a*) suffused with pale yellow, veins yellowish brown, stigma indistinct; Sc moderately long, ending opposite mid-length of RS; Sc₁ and Sc₂ equal in length, short; RS gently arcuated along entire length, two and a half times m-cu; R₂₊₃ meeting R₁ proximad of its tip by a distance equal to its own length, transverse in position, veins R₃ and R₄ fused, cell R₃ consequently obliterated, replaced by a triangular composite cell R₂ and R₃, and producing a venation that is similar to that found in the genus *Limonia* (see fig. 57, *a*); cell M₁ absent; cell 1st M₂ closed, broad, one and a half times as long as broad. Halteres yellowish brown, stems elongate—if bent sideways, reaching to end of abdominal segment 3. Legs long and slender, unicolourous, yellowish brown.

Abdomen dark yellowish brown, slender, bearing the enormous prominent hypopygium whence the generic name is derived; eighth tergite narrow, only one-quarter of the width of the large sternite

which projects partially beneath the hypopygium. Caudal margin of ninth tergite slightly indented medially, lateral angles rounded; mid-basal surface strengthened by chitinous strips, triangular in shape; apex posterior; ninth sternite absent. Basistyles (fig. 86, *b, c*) short, stout, ventral basal surface prolonged caudad into a conspicuous projecting rounded lobe, apex densely clothed with coarse setae and armed with twenty to twenty-five minute spines. Dorsal dististyle (fig. 86, *b*) a rounded lobe, densely covered with elongate stiff setae, the lobe being produced caudad into a long slender chitinised blade, which bears along dorsal margin eleven pairs of spines; each proximad spine blunt, toothlike; each distal spine twice as long, bent at mid-length, tapering, acute (fig. 86, *d*), between each tooth a long seta; ventral dististyle (fig. 86, *c, e*) complicated in structure, consisting of three lateral processes and a large ventral blade, well chitinised and bearing rows of stiff setae along outer surface; apical area prolonged into sharp wide hook; dorso-lateral process the longest, concave, chitinised, having fifteen to eighteen elongate stiff apical setae, this process produced at mid-ventral surface into a large widely rounded lobe, densely clothed with microscopic pubescence and ten to fifteen stiff setae; ventro-lateral process a slender acute glabrous lobe, one-third of the dorso-lateral process in length. Aedeagus (fig. 86, *f, g*) a squat, wide, semi-membranous structure, irregular in shape at broad apical opening, lateral surfaces well chitinised, with Y-shaped rod, the dorsal arm of which is bent into a thin strip of chitin articulating with inner basal angle of basistyle; basal portion of rod articulating in socket in "latera" of penis; penis (fig. 86, *f*) ventral to aedeagus, projecting between the ventro-basal lobes of basistyles; penis sheath long, narrow, semi-chitinised, constricted suddenly near apex, each outer angle shoulderlike, apex of sheath partially divided into two rounded lobes.

Ovipositor with short, stout, but well-chitinised valves, of normal *Tipuline* structure.

Localities.—Cape Peninsula: nil.

Cape Province: Robinson Pass (H. G. W.), November 1937.

Remarks.—The above locality provides the first record for this species in the S.W. Cape. In the field the male imago is easily distinguished from other crane-flies by the fearsome array of processes on the large hypopygium. The flies are to be captured in shady wooded areas along the edges of small mountain streams. Alexander (1920*a*, p. 946) and Rogers (1930—see Alexander, 1931, p. 146)

record the larvae of the American species, *T. complexa*, as inhabiting wet to saturated decaying wood.

Genus GONOMYIA Meigen.

1818. p. 147.

Imago.—Rostrum short, not exceeding rest of head; antennae 16-jointed, simple in both sexes, last three joints normal; wings with Sc_1 moderately long, not extending beyond mid-length of RS; three branches of RS reach wing margin, R_2 beyond fork of R_{2+3+4} , vein R_2 present or missing; cell R_3 short, vein R_3 shorter than petiole of cell R_3 ; R_5 entirely distinct from M_{1+2} , being separated by r-m cross-vein; medial field of wing displays great variation due to frequent atrophy of certain elements, *e.g.* cell 1st M_2 open (*nigrobimbo*) or closed (*sulphurelloides*). Ninth tergite often produced into lobes; basistyles short or long, with three separate dististyles usually, at least two dististyles, of specific shape; ovipositor valves acicular, never reduced.

Larva.—Form slender, terete. Chaetotaxy and creeping welts nil. Spiracular disc tilted dorsad, surrounded by five clear-cut lobes; dorso-median lobe small; inner surface of lobes heavily marked. Anal gills four, globular. Head capsule very dissected, consisting of six chitinised bars. Antenna at least twice as long as broad, auditory organ usually present, solitary papilla conical, conspicuous. Mandible slender, apex a blunt point, three ventral cutting teeth. Maxilla a large fleshy lobe with dense hairs. Labrum-epipharynx long, apex with dense pubescence. Mentum not conspicuous, reduced to two bars, bearing four to six teeth. Hypopharynx a cushion of transverse rows of disc-like protuberances.

Pupa.—Cephalic crest absent or small, inconspicuous. Thorax behind breathing horns flattened. Breathing horns present but small, of specific shape. Chaetotaxy and spines absent from the abdominal segments. Eighth segment of cauda armed with a square of four lobes equal in size to the chitinised projections on the tergal and sternal sheaths.

Six species represent this genus in the S.W. Cape region. The immatures of two species have been correlated and occur in the saturated gravelly sand containing organic matter on the margins of streamlets.

Key to Species of *Gonomyia*.

Imagos.

1. Cell 1st M_2 closed 2.
 Cell 1st M_2 open 3.
2. R_3 twice its petiole R_{2+3} , cell R_2 relatively large, widely divergent at wing margin *mimetica*.
 R_3 only one-third to one-half its petiole R_{2+3} , cell R_2 relatively minute, not so divergent at wing margin *sulphurelloides*.
3. 1st M_2 open in remarkable fashion, *i.e.* basal section of M_{1+2} obliterated, vein m lacking, so that cell M_2 is undivided *brevifurca*.
 1st M_2 open in normal way 4.
4. Black and yellow coloration; ninth tergite with deep notch; ventral dististyle directed caudad *pulcherrima*.
 Black and rufous coloration; ninth tergite with shallow notch; ventral dististyle often directed cephalad *nigrobimbo*.

(*G. flaveola* is not included beyond 4, as a male is unknown and is necessary for accurate determination of the species.)

Larvae.

- Ventral lobes of spiracular disc marked with wide areas of brown, split by a narrow vitta; antenna with apical papilla longer than basal portion *nigrobimbo*.
 Ventral lobes of disc with slender marks of brown, not split by a vitta; antenna with apical papilla shorter than basal portion *sulphurelloides*.

Pupae.

- Breathing horns minute, conical (lateral view), flattened, semicircular (dorsal aspect) *nigrobimbo*.
 Breathing horns larger, narrow and tubular basally, suddenly dilated into flattened circular apices *sulphurelloides*.

Gonomyia sulphurelloides Alex.

Figs. 87, 88.

1921. pp. 197-198, pl. iii, fig. 11 (wing).

Length 4.5-4.7 mm., wing 5.1 mm. General coloration light yellow with dark yellow markings.

Head and rostrum sulphur yellow; palpi dark brown; tubercle conspicuous, sulphur yellow, bifid, protruding over bases of antennae,

each bifurcation bearing two to three apical hairs and a lateral row of six to seven hairs; mesal region with a dark brown blotch, the posterior end of which runs backwards towards the neck. Antennae with scapal joints sulphur yellow, large, elongate-oval, flagellum of 14 dark brown joints, elongate-cylindrical, becoming shorter towards apex of flagellum, clothed with elongate verticils one to one and a half times the length of the joint; joints 4-7 bearing secondary very elongate verticils four to five times the length of joint (these secondary verticils absent in female). Flagellum of female with joint 1 globular, remainder oval, becoming more elongate towards apex, ultimate joint longer than penultimate. Eyes widely separated, ommatidia coarse.

Thorax as described by Alexander; pronotum lighter yellow with a dark brown median stripe meeting the mesonotal median stripe; immediately ventrad of the dark lateral edge of mesonotal praescutum a narrow sulphur-yellow stripe, contiguous with the pronotal stripe and ending at wing base; propleura brownish grey. Wings with Sc short, ending before origin of RS by a distance equal to $m-cu$; Sc_2 difficult to detect; RS arcuated, two and a half times $m-cu$; R_2 absent, consequently element R_{2+3+4} absent, replaced by element R_{3+4} which is twice RS in length; cell R_3 very small, widely divergent; 1st M_2 present, narrowed at inner end; $m-cu$ inserted at fork of M; vein 2S slightly sinuous.

Ninth tergite of male hypopygium (fig. 87, *a*) with a median **V**, apices bluntly rounded. Basistyles short, broader than long, pubescent, bearing two dististyles in apical notch. Dorsal dististyle profoundly divided basally; dorsal arm slender, elongate, tapering suddenly to an acute apex; ventral arm shorter, slender, apex chitinated, slightly hooked, bearing several delicate hairs; ventral dististyle slender, lateral outer margin with a minute spine; apex of dististyle chitinated, bearing several delicate hairs; ventro-caudal lobe of basistyle elongate, dilated slightly mesally, with numerous scattered setae; aedeagal sheath large, feebly chitinated, fleshy; actual penis indistinct.

Localities.—Cape Peninsula: nil.

Cape Province: Seven Weeks Poort (K. H. B., C. W. T., H. G. W.), January 1935.

Natal (Alexander).

Larva.—Length 7.8-8.4 mm., diameter .4-.5 mm. Colour light brown due to delicate appressed pubescence.

Body slender, terete, tapering gradually at thoracic region, a

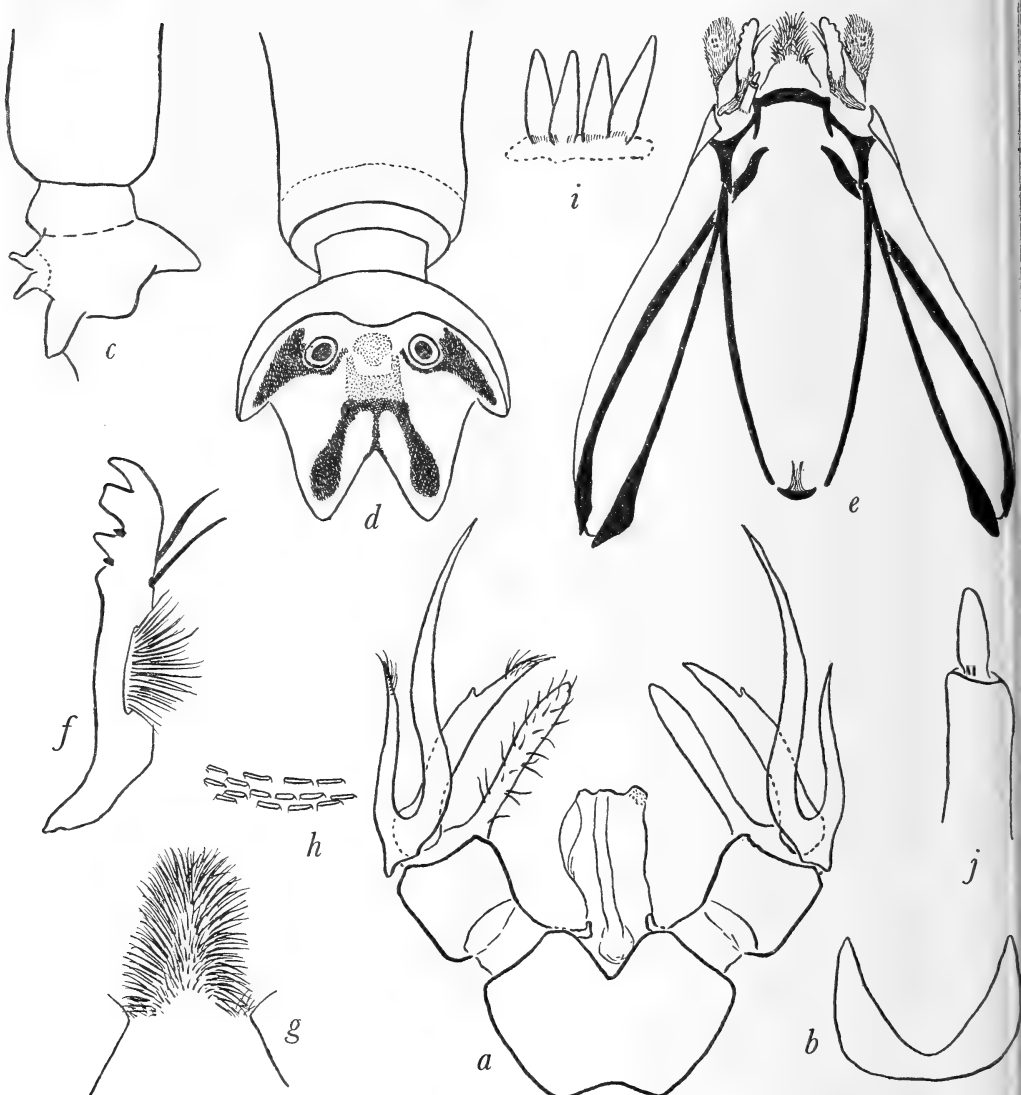


FIG. 87.—*Gonomyia sulphurelloides* Alex. Imago: *a*, male hypopygium; *b*, ninth sternite. Larva: *c*, end of abdomen (lateral view); *d*, spiracular disc (dorsal view); *e*, head capsule (dorsal view); *f*, mandible; *g*, labrum-epipharynx; *h*, protuberance of hypopharynx; *i*, mental papillae; *j*, antenna.

marked annular constriction prior to spiracular disc. Abdominal segmentation indistinct.

Chaetotaxy consisting at most of a few scattered pencils along pleural regions of body. Spiracular disc (fig. 87, *c, d*) tilted dorsad, surrounded by five subequal lobes, fringed by light brownish-yellow hairs, ventral pair of lobes the longest, dorso-median lobe the shortest; centre of disc suffused with two light brown areas, the ventral and larger area giving rise to the dark brown, club-shaped marks which project to the apices of the ventral lobes, inner margin of each lobe lined with dark brown, a seta situated apically; lateral lobes with a dark brown crescent, the arms of which continue past and surround the spiracles; dorso-median lobe with a semi-crescent, split frequently by a yellow vitta. Spiracles circular, dark brown, margined by a narrow light yellow annulus, which in turn is edged with black; spiracles separated by two and a third to three times the diameter of a single spiracle. Anal gills four, white, short, twice as long as broad.

Head capsule (fig. 87, *e*) minute, long, slender, greatly dissected, consisting of six bars, two dorsal, two dorso-lateral and two ventral, the two dorsal bars being the margins of a thin plate, membranous medially, slightly chitinised laterally, apex a short transverse chitinised rod; base of each dorsal bar joined to that of the dorso-lateral bar, this junction continued cephalad to articulate via a Y-shaped rod with a short transverse bar whose lateral projections support the antennae; apices of dorso-lateral bars expanded, flattened; ventral bars broader than the others, long, delicate, anterior end hardly expanded, apparently untoothed; dorso-lateral and ventral bars connected by membranous tissue forming a thin hyaline plate. Antenna (fig. 87, *j*) prominent, unsegmented, cylindrical, apex with a large conical hyaline papilla and two to three minute papillae. Mandible (fig. 87, *f*) slender, apex a bluntly rounded point, ventral cutting-edge with three blunt teeth, outermost tooth truncate, the second tooth conical, bluntly rounded, above and below which is a minute odontoid tooth, basal tooth bluntly rounded, dorsal edge opposite this and the second gives rise to two stout setae, projecting inwards; inner basal region swollen with a long elliptical opening from which extrudes a dense brush of long setae. Maxilla a large fleshy lobe, bluntly rounded, bearing a row of three to five minute sensory papillae on dorsal apical surface, densely covered with long yellowish hairs. Labrum-epipharynx (fig. 87, *g*) long, apex bearing numerous stout sensory papillae, partially concealed by the dense

pubescence of long yellow hairs which arises from mid-region, laterad to this origin a single stout seta. Mental region not conspicuous, reduced to two small adjacent bars, each bearing four to six teeth (fig. 87, *i*). Hypopharynx a large cushion, densely pubescent, with several papillae, entire surface covered basally by juxtaposed transverse rows of elliptical disc-like protuberances (fig. 87, *h*).

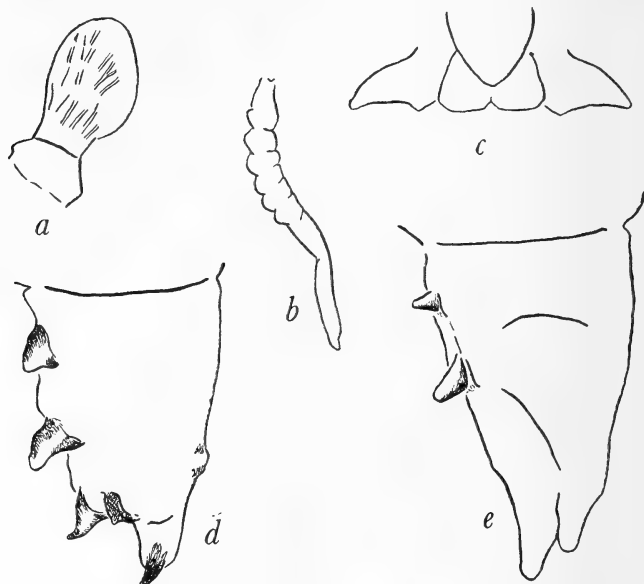


FIG. 88.—Pupa of *Gonomyia sulphurelloides*, Alex. *a*, pronotal breathing horn; *b*, antennal sheath; *c*, mouth parts; *d*, male cauda (lateral view); *e*, female cauda (lateral view).

Pupa.—Length 6.5–6.8 mm., diameter .9–1 mm. Colour of abdomen pale yellow; thorax, wing pads and head light brown; breathing horns whitish yellow; eyes black; mature pupae reveal darker toning to above colours.

Cephalic crest absent. Antennae (fig. 88, *b*) moderately long, extending to base of wing pad, markedly crenulate along outer basal margin. Labrum (fig. 88, *c*) triangular, apex rounded; labial lobes truncate, slightly rounded at each outer angle; maxillary palpi straight, stout at origin, tapering to narrow apices.

Thorax behind breathing horns flattened, each declivity separated by a low median carina and bounded by a low raised ridge, directed laterad along dorso-cephalic angle of mesonotum to above insertion of wing pads, its margin irregularly serrate. Pronotal breathing

horns (fig. 88, *a*) distinct, narrow and tubular basally, suddenly dilated into flattened circular apices (lateral aspect), directed slightly laterad, and uniformly wide (dorsal view). Wing pads end opposite end of abdominal segment 2; leg sheaths opposite end of segment 3, mid-tarsi slightly shorter than the others.

Abdominal segments divided into two annuli, anterior annulus subdivided in turn into two annulets. Chaetotaxy and spines absent. Dorsa and venter of abdominal segments 5-7 lightly chitinised along posterior margins.

Male cauda (fig. 88, *d*) armed with a square of four distinct lobes on eighth segment, the ventral pair the longer; sternal sheaths large, enclosing the elongate dististyles of the male hypopygium, produced dorsad into two closely placed blunt apices; tergal sheaths shorter, bulbous, outer angle produced into a short acute apex.

Female cauda (fig. 88, *e*) armed as in male, tergal sheaths conspicuous, contiguous medially, tapering and directed slightly dorsad into blunt apices; sternal sheaths only slightly shorter, rounded apically (these latter sheaths are longer than in *G. nigrobimbo*).

Remarks.—Associated with the immatures of *Conosia irrorata* (Wiedemann) and *Tipula pomposa* Bergroth were found several larvae and pupae of this species. These occurred some six to twelve inches from the water's edge just below the surface of a low mound of saturated gravelly sand containing a small percentage of black silt. The quick, wriggling larvae tend to proceed to the drier portions of the mound prior to pupation. Minimum pupal duration: six days.

Alexander (1920*a*, p. 940) found the immatures of *Gonomyia sulphurella* O. S. a close ally to the above species, in "mud along the banks of streams."

Gonomyia nigrobimbo Alex.

Figs. 89, 90.

1934. pp. 60-61.

Length 4-4.5 mm., wing 3.6-4 mm. Holotype male well described but not figured by Alexander.

General coloration black with obscure rufous markings. Antennae (fig. 89, *b*) 16-jointed, black, clothed with short pubescence and scattered longer setae; scapal joint 1 short-cylindrical, twice as long as broad; scapal joint 2 subglobular, one-half length of first joint;

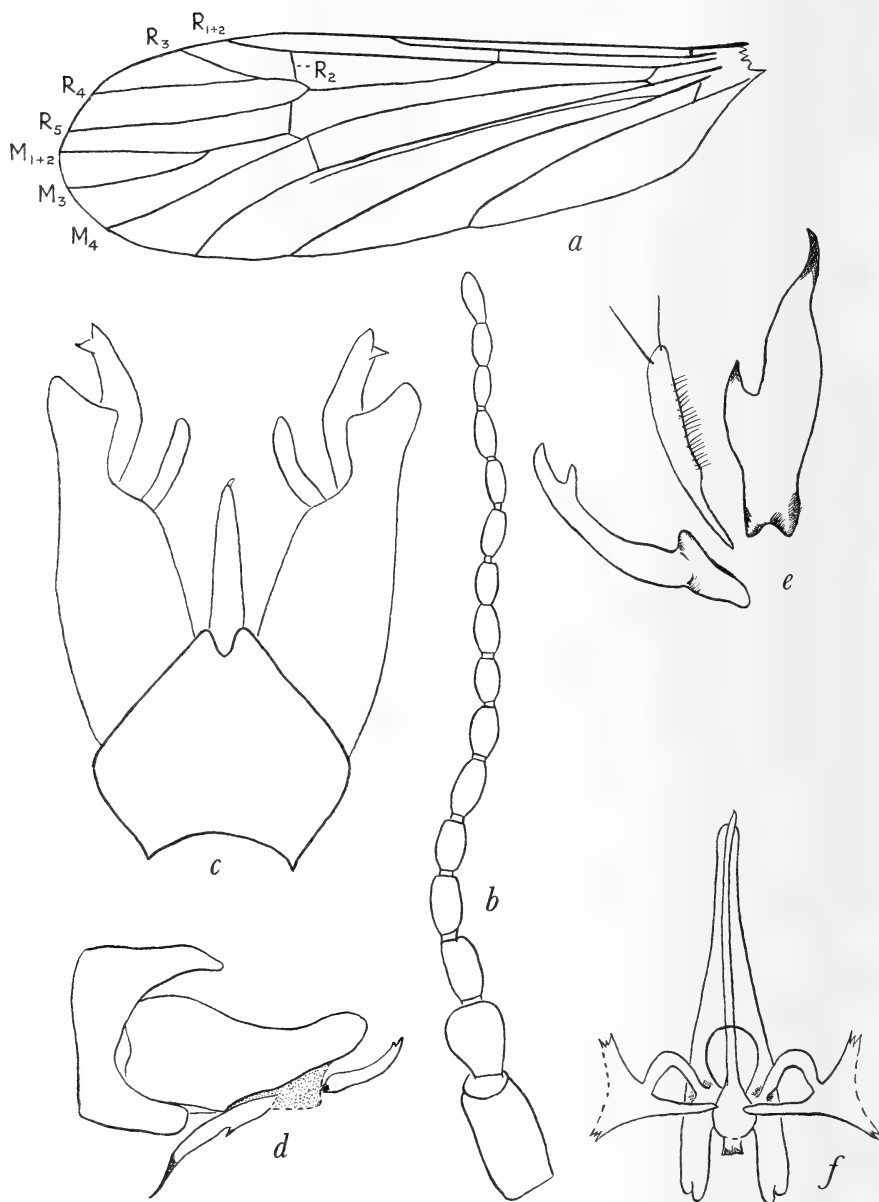


FIG. 89.—*Gonomyia nigrobimbo* Alex. *a*, wing; *b*, antenna; *c*, *d*, male hypopygium (dorsal and lateral views); *e*, dististyles (male hypopygium); *f*, aedeagal sheath and penis (dorsal view).

flagellar joints becoming gradually shorter and more slender, short-oval, one and three-quarters to twice as long as their broadest diameter; ultimate joint longer than penultimate.

Wings (fig. 89, *a*) suffused with black, veins black; Sc_1 elongate, two and a half times $m-cu$, terminating at mid-length of RS; Sc_2 far removed from tip of Sc_1 , terminating at origin of RS; R_2 inserted from fork of RS by one-half its own length and equal to $r-m$ cross-vein in length; RS straight, five times $m-cu$; cell R_3 widely divergent, twice its petiole in length; 1st M_2 open by atrophy of outer deflection of M_3 (in Alexander's holotype the distal section of M_3 lies free in the membrane of the wing); cell M_3 divergent, one and a half times its petiole; $m-cu$ inserted before fork of M but frequently at or beyond fork of M. Ninth tergite of male hypopygium (fig. 89, *c*) with caudal margin prolonged into two lobes, apices bluntly rounded, separated by a short shallow V. Basistyles twice as long as broad, pubescent, outer apical angle produced caudad into a conspicuous powerful lobe concealing the insertion of the three dististyles which articulate within the notch of each basistyle; this notch situated on the ventral inner surface of basistyle and is best seen from a ventral aspect. Dorsal dististyle (fig. 89, *e*) a curved, simple, flattened rod, dilated basally, its apex broadly bifid; mesal dististyle an elongate-cylindrical pubescent rod, rounded apically; ventral dististyle elongate, often directed cephalad and projecting conspicuously beneath the basistyle, its base dilated, apical half narrowed into a long, sinuous, acute point, mesal lateral margin produced into a strong acute spine, setiferous. Aedeagus (fig. 89, *f*) an elongate conspicuous tapering setiferous sheath, connected to inner portion of each basistyle by a semi-circular strip of chitin; "latera" slightly swollen; penis slender, bulbous portion small.

Tergal valves of female ovipositor flattened, slender, bladelike structures, curved slightly dorsad, twice as long as sternal valves which are straight and thicker.

Localities.—Cape Peninsula: Fernwood (C. W. T., H. G. W.), November 1934; (C. W. T.) January 1933.

Cape Province: Oudebosch (Lightfoot), December 1920.

Larva.—Length 9–9.5 mm., diameter .75–.9 mm. Colour dull yellow.

Form terete, slender, tapering gradually towards thoracic region, a marked constriction prior to spiracular disc, greatest diameter of body at fourth segment; integument thin, revealing the underlying longitudinal muscle fibres.

Chaetotaxy and creeping welts absent. Spiracular disc (fig. 90, *a*) tilted dorsad, surrounded by five lobes, dorso-median lobe small,



FIG. 90.—Pupa of *Gonomyia nigrobimbo* Alex. Larva: *a*, spiracular disc. Pupa: *b*, head and thorax (lateral view); *c*, head (ventral view); *d*, *e*, pronotal breathing horn (dorsal and lateral views); *f*, ridge of thorax; *g*, female cauda (lateral view); *h*, male cauda (lateral view).

bearing a minute rectangular mark on inner surface; the remaining four lobes stout, bluntly rounded apically, their margins fringed with short delicate hairs; lateral lobes marked with a dark brown

triangle split medially by a thin yellow vitta; ventral lobes marked with a small triangle and a large rectangle of brown separated by a thin vitta, the latter mark bearing a long stiff seta apically; spiracles small, separated by three times the diameter of a single spiracle, each surrounded by a pale brownish area which becomes a distinct oblong between the spiracles. Anal gills four, white, stout, globular.

Head capsule minute, greatly dissected, the six heavily chitinised bars arranged and articulating as in *G. sulphurelloides*. Antenna unsegmented, cylindrical, apex with a large conical hyaline papilla, longer than the basal segment, surrounded by two to three minute papillae. Mandible slender, apex bluntly rounded, toothlike; ventral cutting-edge with three blunt teeth, outermost tooth the largest, all bluntly rounded; dorsal cutting-edge with two teeth, subacute, proximal tooth a minute peg; basal region as in *sulphurelloides*. Remainder of head capsule as in *sulphurelloides*.

Pupa.—Length 6·8–7·2 mm., diameter ·8–1 mm. Newly formed pupae pale cream, slightly chitinised on head and thorax; older pupae light yellowish brown, wing pads and leg sheaths black.

Cephalic crest (fig. 90, *b*, *c*) small, represented by a conical protuberance at origin of each antennal sheath, which is crenulate on outer margin at each joint and which extends to bend in fore femora. Labrum (fig. 90, *c*) triangular, apex obtusely rounded; labial lobes rounded and slightly produced at outer angle; maxillary palpi straight, stout at origin, tapering to blunt apices.

Thorax behind breathing horns flattened, each declivity separated by low median carina and bounded by a high raised ridge, irregularly serrate (fig. 90, *b*, *f*), directed laterad along dorso-cephalic angle of mesonotum to above the insertion of wing pad. Pronotal breathing horns (fig. 90, *b*, *d*, *e*) small, short, flattened, distal margin irregular, semicircular (dorsal aspect), conical, directed dorsad (lateral aspect). Wing pads extend almost to end of abdominal segment 2; leg sheaths opposite end of abdominal segment 3; mid-tarsi shorter than others.

Abdominal segments indistinctly divided into two annuli, devoid of chaetotaxy and spines, mottled with dark brown blotches and spots.

Male cauda (fig. 90, *h*) armed with a square of four prominent equal lobes on eighth segment; sternal sheaths large, bulbous, irregularly rounded apically, outer dorsal angle slightly produced; tergal sheaths not projecting beyond sternal sheaths, slender, divergent, curved strongly dorsad, tapering to acute, heavily chitinised spinelike apices.

Female cauda (fig. 90, *g*) armed as in male; tergal sheaths conspicuous, contiguous medially, tapering and directed slightly dorsad into acute chitinated apices; sternal sheaths shorter, small, rounded apically.

Remarks.—At Fernwood Ravine the immatures of this species were found by Mr. Thorne and the author in the saturated organic sand on the margins of the forest rill (November 1934), associated with the larvae of *Limnophila dubiosa*. The striking black and rufous flies scurry in Stone-fly fashion over the boulders and small stones protruding from the stream and seem loath to take to flight. Pupation occurs in the dry sand-spits under the shelter of a convenient rock, this stadium taking eight to nine days.

Gonomyia pulchrissima Alex.

Fig. 91.

1921. pp. 200–201.

Length 3.4–3.6 mm., wing 2.3–2.5 mm. Holotype male not figured by Alexander.

General coloration yellow with brownish-black markings. Antennae (fig. 91, *b*) 16-jointed; scapal joint 1 cylindrical, twice as long as broad; scapal joint 2 subglobular, half as long as previous joint; flagellar joint 1 broad-cylindrical, as broad as long; joints 2–6 short, slightly fusiform rather than cylindrical, one and a half times as long as broad, equal in length to joint 1; joints 7–14 narrower than previous joints, becoming twice as long as broad and more fusiform.

Wings (fig. 91, *a*) suffused with light yellow, veins brown; Sc ending opposite one-third the length of RS, Sc₂ apparently absent, R₂ difficult to detect (Alexander states: “r rather indistinct, connecting R₂ just beyond base”), RS straight, five to five and a half times m-cu; cell R₃ deep, two and a quarter to two and a half times its petiole, widely divergent, vein M₃ most variable in length being (*a*) with tip of M₃ lying free in wing membrane and equal to m-cu; (*b*) lying free and three times m-cu; (*c*) usually connected to M₁₊₂, consequently cell 1st M₂ open by the atrophy of outer deflection of M₃ and one to one and a half times its petiole; m-cu inserted at fork of M.

Male hypopygium (fig. 91, *c*) with caudal margin of ninth tergite prolonged into two elongate, uniformly wide lobes, separated by a

deep narrow U-shaped sinus, one-half the length of the tergite and terminating opposite mid-length of basistyles, apices bluntly rounded and directed slightly ventrad. Ninth sternite broad-triangular. Basistyles twice as long as broad, pubescent, outer apical angle

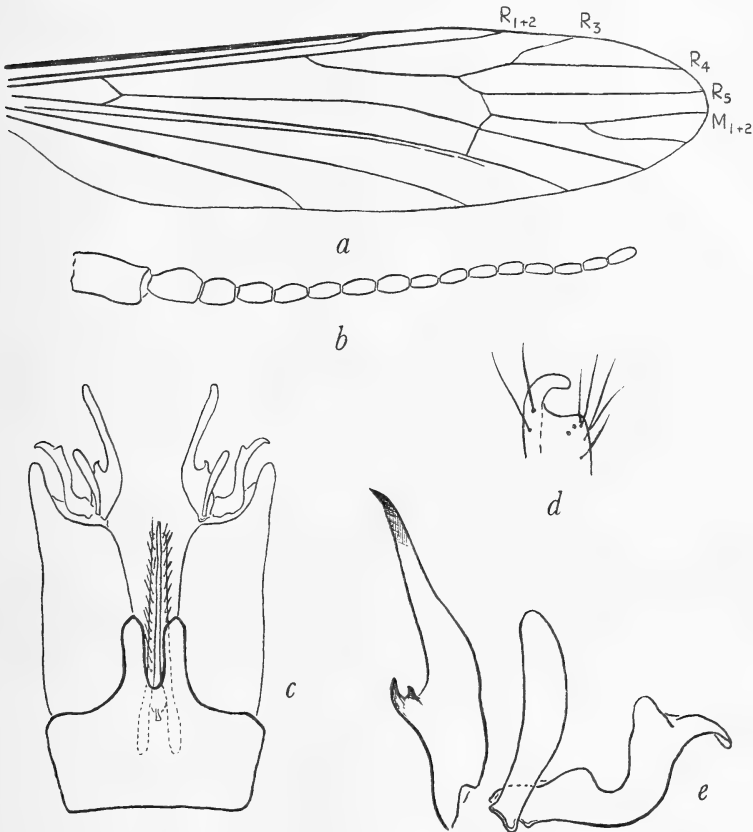


FIG. 91.—*Gonomyia pulcherrissima* Alex. a, wing; b, antenna; c, male hypopygium (dorsal view); d, tip of penis (lateral view); e, dististyles (male hypopygium).

prolonged caudad into a conspicuous powerful lobe, bluntly rounded and forming the lateral portion of the apical notch which bears three dististyles: dorsal dististyle (fig. 91, e) a strongly chitinised, powerful, flattened blade, swollen basally, then constricted and sharply bent at mid-length, apex dilated into a small round pubescent protuberance and a large subacute hook; middle dististyle (fig. 91, e) a simple clavate rod clothed with short hairs; ventral dististyle (fig. 91, e)

elongate, largest of the three dististyles, its base dilated, apical half narrowed into an elongate, sinuous, acute rod, inner mesal angle with two chitinised hooks, the inner the larger. The apical notch of the basistyles is continued ventrally for a distance in order to accommodate the swollen bases of the three dististyles. This led Alexander to state erroneously that "the longest pair" (*i.e.* the ventral dististyles) "are apparently attached to the sternite." Inner basal edge of basistyles connected to the narrow chitinous strips projecting laterad and slightly dorsad from the base of the aedeagus. Aedeagal sheath simple in structure, consisting of an elongate, pubescent, semi-chitinised tube surrounding the slender penis, flattened and uniformly wide (viewed laterally); apex of penis curved strongly ventrad (fig. 91, *d*), acute; "latera" slightly swollen, bulbous portion of penis minute.

Localities.—Cape Peninsula: nil.

Cape Province: French Hoek Pass (K. H. B.), December 1916; (G. A. W., H. G. W.) December 1932.

Remarks.—This beautifully coloured crane-fly is by no means common and seems confined to the immediate vicinity of small mountain rills and streams. Like *G. nigrobimbo* the adults are loath to take to flight and are captured only by sweeping.

Gonomyia mimetica Alex.

1921. p. 198, pl. iii, fig. 14 (wing); pl. iv, fig. 23 (hypopygium).

♂: Length 4.5 mm., wing 5.2 mm. General coloration greyish yellow, abdomen brownish. Wing described and figured by Alexander.

Male hypopygium with ninth tergite narrow, prolonged medially into a square lobe, extending half-way up the basistyles, each outer angle more densely clothed with stiff hairs; ninth sternite narrow, produced caudad into broad rounded lobe, apex pubescent. Basistyles twice as long as broad, pubescent, outer apical angle moderately prolonged as small lobe; two dististyles articulate in apical notch of each basistyle; dorsal dististyle stout, subcircular, inner apical angle produced into short rounded tubercle, clothed with ten to fifteen stiff hairs, outer apical angle produced as powerful, pubescent, heavily chitinised, laterally curved hook; ventral dististyle an elongate, slender, pubescent rod, twice as long as dorsal dististyle.

Aedeagus elongate, projecting beyond tips of basistyles, a lightly chitinated tube surrounding the slender penis, dorso-apical region prolonged into a slender acute rod, slightly shorter than tip of penis, which projects from aedeagal sheath, "latera" short.

Localities.—Cape Peninsula: nil.

Cape Province: Montagu (Tucker), October 1919.

Natal (Alexander).

Gonomyia flaveola Alex.

1921. pp. 199–200, pl. iii, fig. 13 (wing).

Female known. Length 5·8–6·3 mm., wing 6–6·5 mm. General coloration yellow. Wing described and figured by Alexander.

Localities.—Cape Peninsula: nil.

Cape Province: Knysna (Peringuey), October 1916.

Gonomyia brevifurca Alex.

1917. pp. 153–154, pl. xi, fig. 18 (wing).

Holotype male, with the exception of the hypopygium, fully described by Alexander. Wing figured.

Length 4 mm., wing 3·3 mm. General coloration yellow with blackish markings.

Male hypopygium similar to that of *G. pulchrissima*, differing as follows: ninth tergite with caudal margin only slightly prolonged medially into two short lobes, separated by a shallow notch, not extending beyond origin of the "latera" on the aedeagal sheath. Aedeagal sheath thus appears relatively longer, although in matter of fact it is not longer than that of *G. pulchrissima*. Tip of sheath longer, tapering to a wide opening, prolonged slightly ventrad, not truncate, tip of penis not reaching apex of sheath when in normal position.

Localities.—Cape Peninsula: nil.

Cape Province: Landdrost (K. H. B.), 1916.

Genus RHABDOMASTIX Skuse.

1890. p. 828.

Imago.—Antennae 16-jointed, moderately long, two and a half times combined head and thorax, flagellar joints elongate-cylindrical

or elongate-fusiform, on average seven to eight times as long as broadest diameter; wings with Sc moderately long, ending opposite mid-length of RS; RS long, five and a half times m-cu; R_{2+3} transverse in position; cell R_3 widely divergent, vein R_{2+3} less than one-half the length of its petiole; three branches of RS reach wing margin; cell M_1 absent; cell 1st M_2 small, hexagonal. Penis moderately long; aedeagus of two chitinated rods dorsad and laterad of base of penis, supporting gonapophyses which are long, slender, acute; ovipositor of normal *Tipuline* structure, with chitinated acicular valves.

Larva.—Form very slender, elongate. Spiracular disc microscopic, apparently lobeless, the two spiracles elliptical, margins of disc with fine, moderately long setae. Chaetotaxy reduced, of microscopic hairs, scanty in distribution. Head capsule minute, of three narrow plates. Mandible long, chitinated, cutting-edge toothless. Antenna elongate, cylindrical, apical papilla one-quarter its length. Labrum-epipharynx with five sharp teeth and numerous dorsal hairs. Maxilla a large lobe projecting from prothoracic orifice. Hypopharynx with three teeth. Mentum an indistinct transverse bar.

Pupa.—Cephalic crest large, of two closely placed protuberances, acute apically. Pronotal breathing horns microscopic, mere tubercles directed outwards. Abdominal segments with a transverse row of few setae. Tergal and sternal sheaths large, at base of former a bifid lobe, setiferous; eighth segment of cauda with lateral tuberculate setae and two dorsal bifid lobelike spines.

As far as the author is aware, this genus has not previously been recorded from South Africa. It is represented in the S.W. Cape by the single species, *R. afra*, described herein. The immatures occupy the wet, saturated sand-spits in small mountain streams.

Rhabdomastix afra sp.n.

Figs. 92, 93.

♂: Length 4-4.5 mm., wing 3-3.2 mm. Rostrum very short, maxillary palpi minute; head light brown, broad, somewhat flattened dorso-ventrally; eyes large, black. Antennae (fig. 92, b) 16-jointed, clothed with numerous delicate hairs one-half the length of flagellar joint, light yellowish brown, scape darker, elongate, two and a half times the head and thorax combined—if bent backwards, extending to end of abdominal segment 1; scapal joints equal in length, subglobular, as broad as long; flagellar joint 1 peglike, practically twice

the length of previous joint, remaining flagellar joints elongate-cylindrical or slightly fusiform, joints 2-5 becoming increasingly longer, approximately six times as long as broadest diameter; joints 6-10 equal in length, seven times as long as broad; joints 11-13 shortening gradually, being eight times as long as broad; ultimate joint one-quarter of penultimate in length, but four times as long as broad, rounded apically.

Mesonotal praescutum rufous brown with a single narrow, median, dark brown stripe split by a thin vitta of pale yellow. Pleura and legs light sepia brown, with two indefinite stripes on the former extending from wing root to mid and hind coxae, these stripes split by a pale vitta. Wings (fig. 92, *a*) with stigma indistinct, veins light yellowish brown; Sc moderately long, terminating opposite mid-length of RS, Sc₁ short, twice the length of Sc₂; RS long, arcuated slightly at origin, five to five and a half times m-cu; R₂₊₃ short, transverse in position, not joined to R₁ but reaching wing margin distad to tip of R₁ by a distance equal to its own length, cell R₃ short, widely divergent, only two-thirds its petiole R₂₊₃₊₄; vein R₄ slightly longer than R₂₊₃₊₄; r-m long, equal to m-cu, creating a wide cell R₅; cell M₁ absent; cell 1st M₂ closed, small, longitudinally hexagonal; vein 2A short, straight.

Abdomen rufous brown with darker coloration along pleurites. Ninth tergite of hypopygium (fig. 92, *c*) broad, chitinated on either side of membranous median portion which is prolonged caudad as an irregular fleshy lobe overlying and concealing aedeagal structure. Basistyles long and slender (fig. 92, *d*), two and a third as long as broad, pubescent, from whose apical notch articulate two prominent dististyles, the dorsal (fig. 92, *d*) a heavily chitinated, slightly curved rod, dilated at origin, bluntly rounded, outer angle bent into a short acute hook, outer margin armed with double row of eighteen to twenty acute minute spines; ventral dististyle (fig. 92, *d*) a wide flattened fleshy blade, tapering to a bluntly rounded apex. Penis (fig. 92, *d*) moderately long, slender, bulbous basally; aedeagal structure (fig. 92, *d*) composed of straight chitinated rod dorsad and laterad of base of penis and connected to it by muscular fibres; from the apical notch of each rod articulates the elongate, slender, conspicuous, acutely pointed gonapophyses (fig. 92, *d*, *e*), the base of which is prolonged into a short arm attached to the chitinated projection from the inner basal surface of the basistyle.

Ovipositor of normal *Tipuline* composition, consisting of chitinated acicular valves.

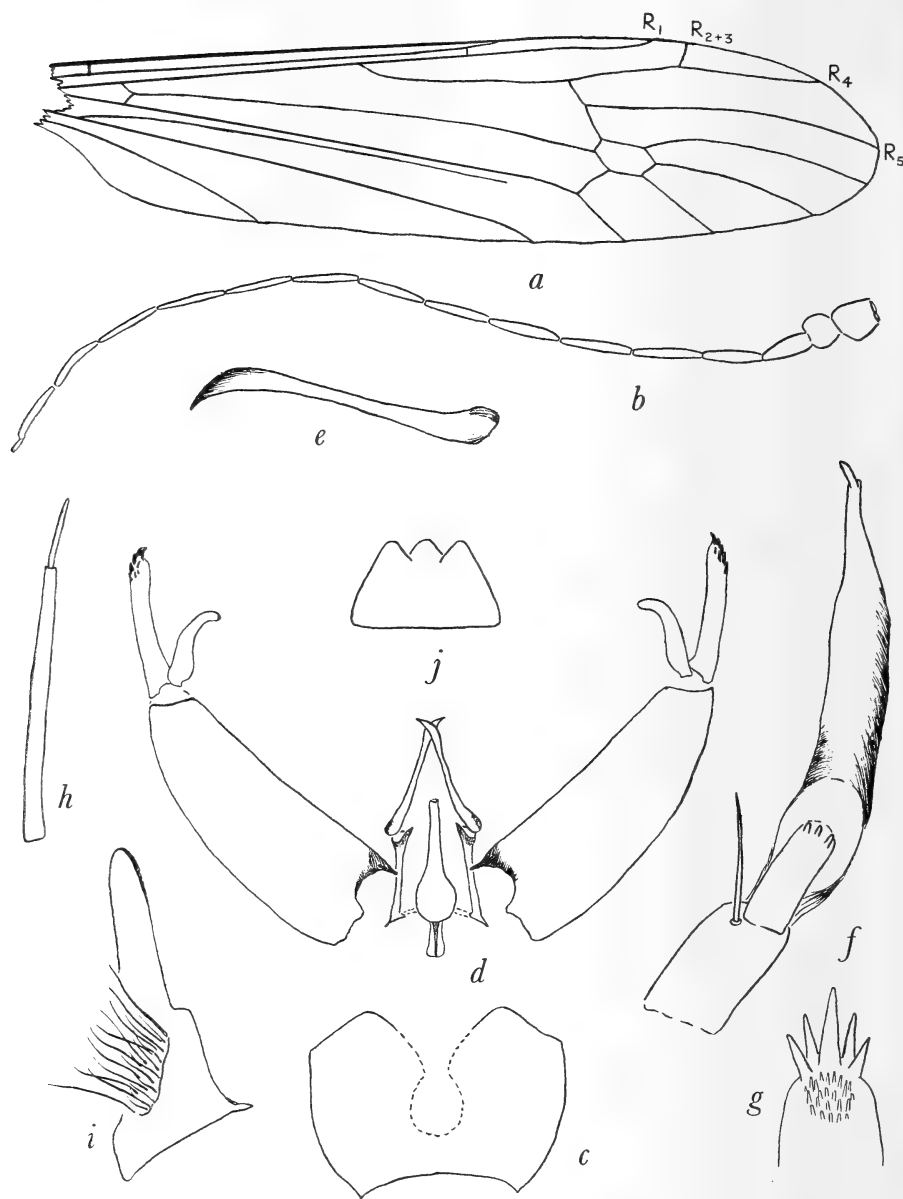


FIG. 92.—*Rhabdomastix afra* sp.n. Imago: a, wing; b, male antenna; c, ninth tergite (dorsal view); d, male hypopygium (dorsal view), ninth tergite removed; e, gonapophysis. Larva: f, maxilla; g, labrum-epipharynx; h, antenna; i, mandible; j, hypopharynx.

Localities.—Cape Peninsula: Platteklip (K. H. B.), November 1932 and 1934; (G. A. W., H. G. W.) December 1934; Orange Kloof (K. H. B., C. W. T.), March 1934.

Cape Province: Oudebosch (C. W. T., H. G. W.), September 1933.

Larva.—Length 14–16 mm., diameter .6–.7 mm. Body elongate, terete, slender, abdominal segments about three times as long as broad, pro- and mesothoracic segments slightly narrowed; hyaline tips of maxillary lobes projecting from the prothoracic orifice. Integument opaque with microscopic appressed pubescence which becomes longer on the sixth and seventh segments; penultimate segment frequently distended to a pronounced swollen ring; considerably lighter in colour than remainder of abdomen; ultimate segment short, one-third the length of seventh segment, tapering quickly to blunt apex bearing the two spiracles.

Chaetotaxy composed of microscopic pencils of delicate hairs scattered along anterior margins of thoracic segments.

Spiracular disc microscopic, lobeless even under high magnification, margins of disc sparsely clothed with fine, moderately long setae; spiracles dark brown, minute, closely placed, elliptical, major axis lying dorso-ventrally.

Head capsule minute, consisting of three plates, narrow, margined with strips of chitin, the dorsal plate the largest, truncate caudally, each marginal strip of chitin articulating in the socket of a Y-shaped rod situated laterad of base of each mandible. Mandible (fig. 92, *i*) long, slender, heavily chitinised, deep at base, apex bluntly rounded, ventral cutting-edge sharpened but toothless, basal slit with brush of elongate, stiff, acute setae, which partially conceals the mandible. Antenna (fig. 92, *h*) greatly elongated, a slender semi-transparent cylinder, apical papilla very slender, one-quarter the length of basal segment, without papillae at its base. Labrum-epipharynx (fig. 92, *g*) a long projecting structure, apex with row of five conspicuous sharp teeth arranged fanwise, their bases partially concealed by a large tuft of short hairs. Maxilla (fig. 92, *f*) a large fleshy lobe, wide basally, bearing a prominent, rounded, fleshy lobelet, latered of which is a short stiff seta, ventral surface of maxilla greatly prolonged into a hyaline apex which projects normally from prothoracic orifice. Hypopharynx (fig. 92, *j*) a short, wide, chitinised plate with three minute subacute teeth. Mental region not conspicuous, reduced to a small semi-chitinised transverse bar articulating with ends of chitinised strips of lateral plates of head capsule.

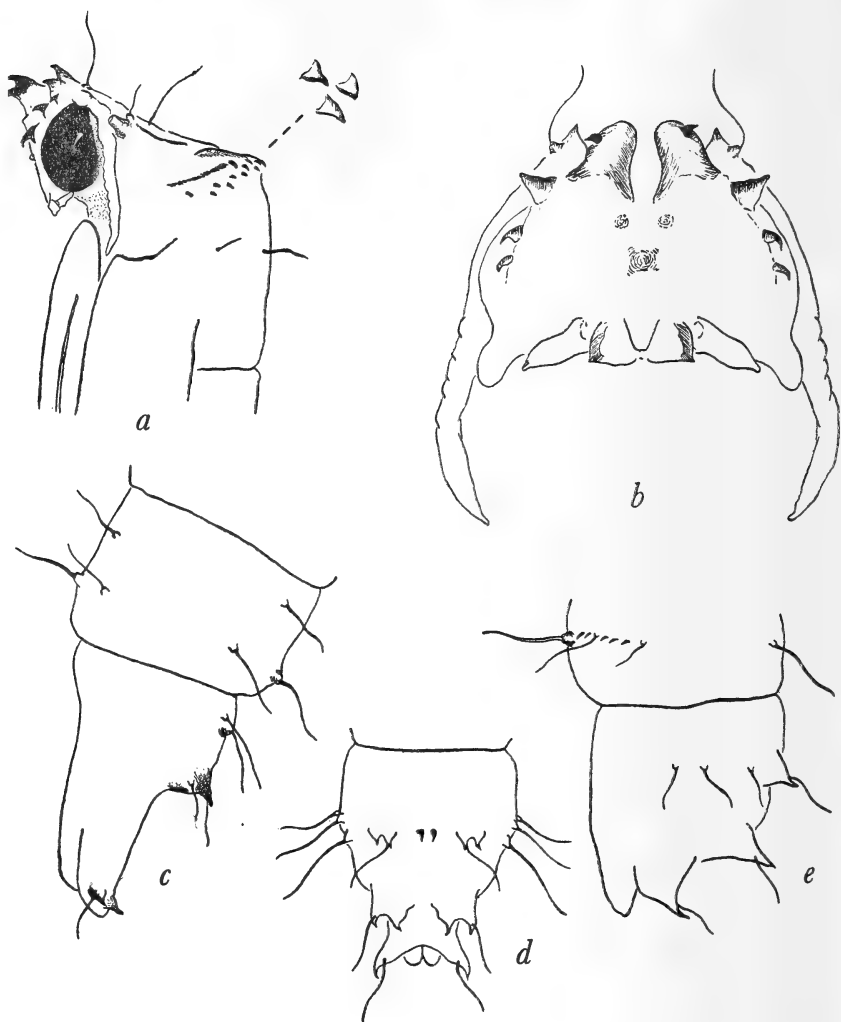


FIG. 93.—Pupa of *Rhabdomastix afra* sp.n. *a*, head and thorax (lateral view); *b*, head sheath (ventral view); *c*, female cauda (lateral view); *d*, *e*, male cauda (dorsal and lateral views).

Pupa.—Length 5.2–5.5 mm., diameter .7–.8 mm. Colour pale yellow to light yellowish brown; head and thorax of mature pupae heavily chitinised; wing pads dark brown.

Head prominently projecting ventrad, neck narrow. Cephalic crest (fig. 93, *a*, *b*) moderately large, conspicuous, composed of two

closely placed median protuberances, ventrally directed, apices bifid, acute chitinated points; at caudal surface of each base a small rounded swelling. Laterad and dorsad of cephalic crest, at the origin of each antennal sheath, occurs a large bifid lobe, each bifurcation slightly chitinated, acute; dorsad of each base an elongate tuberculate seta. Along margin of each eye are three small, chitinated, acute, lobelike spines. Antennal sheaths crenulate along outer margin at each joint, slightly curved towards apex, which extends to bend in fore femora.

Thorax behind breathing horns depressed, each depression separated by a high median carina and bounded by a low raised ridge, directed laterad along dorso-cephalic angle of mesonotum to above the insertion of wing pad, this ridge bearing two to three rows of minute scattered chitinated spines, those on median region becoming longer and stouter; on either side of the high median carina an elongate tuberculate seta. Laterad of each breathing horn a short tuberculate seta. Pronotal breathing horns microscopic (fig. 93, *a*), being mere raised tubercles directed outwards, difficult to detect even under high magnification. Across meso- and metathorax and dorsum of abdominal segment 1 a row of four short setae. Wing pads extend to end of abdominal segment 2; leg sheaths opposite end of abdominal segment 4.

Abdominal segments 2-7 indistinctly subdivided into three or four narrow transverse annuli, bearing short delicate chaetotaxy as follows: dorsum of segments 2-7 with subterminal transverse row of eight setae, often arranged in pairs on segments 6-7; in addition segments 5-7 have a mesal transverse row of four setae; venter of segments 2-4 bare, segments 5-7 with subterminal row of four setae, situated along a row of evenly spaced, acute microscopic spines, twenty-four in number; in addition occurs a mesal transverse row of four setae.

♂ cauda (fig. 93, *d, e*): Sternal sheaths short, closely placed along median line, apices widely rounded; tergal sheaths widely divergent, tapering to acute, chitinated, spinelike apices, inner apical angle bearing an elongate tuberculate seta. Cephalad of each tergal sheath a wide, dorsally directed, bifid lobe, the bifurcations tapering to chitinated spines, outer bifurcation armed with elongate seta. Eighth segment of cauda bearing three lateral tuberculate setae, on dorsum two short acute spines on median line, laterad of which occurs a short, bifid spinelike lobe armed with a long seta on inner surface of inner bifurcation.

♀ cauda (fig. 93, c): Sternal and tergal sheaths elongate, contiguous medially, the latter sheaths the larger, bearing on outer apical angle two curved hooklike spines, the outer having a short seta; eighth segment of cauda as in male.

Remarks.—Dr. Barnard and the author discovered the immatures of this species amid the small gravelly sand-spits under small rocks where they were sheltered from the main force of the cascading stream (Platteklip; November 1933). Several pupae occurred in the drier regions of the spits in these rock shelters where the sand was raised two to three inches above the level of the water. Pupal stadium: eight to ten days.

In November 1934 Dr. Barnard and Mr. Thorne found additional larvae and pupae under similar conditions at Orange Kloof.

Genus ERIOPTERA Meigen.

1803. p. 262.

Imago.—Rostrum short, not exceeding rest of head; antennae simple in both sexes, terminal joints not conspicuously shortened; 15-jointed (except *E. peringueyi*, where 16-jointed); wings with Sc_1 short, terminating near Sc_2 and prior to mid-length of RS (except *peringueyi*, where Sc_1 long, equal to RS and terminating distad to branching of RS); three branches of RS reach wing margin; cell R_3 short and divergent with vein R_3 shorter than petiole of cell R_3 (or cell R_3 deep with vein R_3 longer than petiole of cell R_3 , veins R_3 and R_4 parallel), R_5 distinct from M_{1+2} by r-m cross-vein; cell M_1 absent; cell 1st M_2 absent (except *E. ignava* and *clausa*); male hypopygium with basistyles short and wide, having a single dististyle (except *E. peringueyi*, *clausa* and *bonae spei*). Female ovipositor valves reduced, fleshy, occasionally acicular (*E. clausa*).

Larva.—Form slender, elongate. Creeping welts or pads absent. Spiracular disc with four slender lobes, ventral lobes three and a half times the length of dorsal lobes, fringed with moderately long hairs. Head capsule long, slender, of three plates with chitinated margins. Labrum and maxilla as in *Gonomyia*. Remainder of capsule cannot be given until additional material is available.

Pupa.—Cephalic crest absent. Pronotum depressed on either side of median carina; breathing horns absent even under high magnification. Abdominal segments unarmed with spines but with chaetotaxy of four to six minute dorsal setae along posterior margin of segments.

Cauda with sternal sheaths bulbous, stout; tergal sheaths shorter, caudal margin of each bifid, outer bifurcation large, directed dorso-caudally into chitinised lobe; eighth segment of cauda with minute tubercles, no large spines or spinelike lobes.

This genus contains eight species in the S.W. Cape. The pupae of two have been correlated. Their habitat is the muddy sand-spits along the margins of streams.

Key to Species of Erioptera.

Imagos.

1. Cell 1st M_2 closed (fig. 100, *a*) 2.
 Cell 1st M_2 open (fig. 94, *a*) 3.
2. Large forms (5.8–6 mm., wing 6.7–6.8 mm.); ovipositor reduced, valves minute, fleshy *ignava*.
 Small forms (2 mm., wing 3 mm.); ovipositor normal, valves elongate, acicular *clausa*.
3. Wings densely clouded by two transverse bands of colour; Sc_1 long, equal to RS; vein 2A conspicuously sinuous (fig. 99, *a*) *peringueyi*.
 Wings hyaline; Sc_1 short, less than one-half RS; vein 2A almost straight (fig. 96, *a*) 4.
4. RS curved, forming with upper branch (R_{2+3+4}) a distinct semicircular outline; cell R_3 short, *i.e.* one to one and a half times its petiole, veins R_3 and R_4 widely divergent (fig. 96, *a*); in male hypopygium two dististyles articulate in apical notch of each basistyle (fig. 96, *c*) *bonae spei*.
 RS straight (fig. 97, *a*); cell R_3 deep, *i.e.* at least four times its petiole; veins R_3 and R_4 practically parallel (fig. 97, *a*); in male hypopygium a single dististyle articulates with each basistyle (fig. 97, *c*) 5.
5. In male hypopygium outer apical angle of basistyle is prolonged into a strong, conspicuous, chitinised rod as long as basistyle (fig. 97, *c*) *longicalcaratus*.
 In male hypopygium this rod absent 6.
6. Ninth tergite of male hypopygium produced medially into two slender, closely placed, ventrally directed lobes, separated by deep narrow V (fig. 94, *e*); aedeagus armed with two dorsally curved, acute hooks (fig. 94, *c*) *claripennis*.
 Ninth tergite of hypopygium elongate-triangular, narrowed to a single acute apex (fig. 98, *c*); aedeagus devoid of acute hooks (fig. 98, *f*) 7.
7. Sc_2 removed from tip of Sc_1 by distance equal to m-cu; cell R_3 very deep, *i.e.* fifteen times its petiole; cell M_3 five times its petiole (fig. 98, *a*) *witzenbergi*.

Sc_2 removed from tip of Sc_1 by distance equal to one-third of m-cu; cell R_3 deep, i.e. four and a half times its petiole; cell M_3 three times its petiole (fig. 100, e) *brumatus*.

Pupae.

1. Colour light yellow; two inner bifurcations on tergal sheaths almost as large as outer bifurcations, conical in shape . . . *witzenbergi*.
 Colour dark orange-yellow; outer bifurcation of tergal sheaths large, prominent; inner bifurcation a minute, conical, spinelike lobe *claripennis*.

Erioptera claripennis Alex.

Figs. 94, 95.

1921. pp. 191–192, pl. iii, fig. 10 (wing).

Length 3 mm., wing 4.4 mm. Colour dark brown, often dusted with grey.

Antennae (fig. 94, b) 15-jointed: scapal joint 1 equal to joint 2, which is large and subglobular and after which the flagellar joints appear suddenly slender and shorter, joints 1–4 being oval, almost twice as long as broadest diameter, remaining joints becoming more fusiform, two and a half times as long as broad; ultimate joint longer than penultimate, rounded apically, constricted basally.

Wings, described by Alexander, as in fig. 94, a. Sc long, terminating at three-quarters the length of RS , Sc_2 much removed from tip of Sc_1 by a distance equal to length of vein R_{2+3} , terminating before fork of RS by a distance equal to R_{2+3+4} ; RS long and straight, five times m-cu; cell M_3 four times its petiole in length, becoming increasingly divergent as vein M_4 is straight, m-cu inserted at two-thirds of M_{3+4} ; veins 1A and 2A straight.

Male hypopygium (fig. 94, e, f) with ninth tergite wide basally and bearing eight to ten coarse hairs on dorso-median margin, tapering suddenly and produced medially into two slender, closely placed, ventrally directed lobes, separated by a deep narrow V, each lobe truncate and blackened apically; ninth sternite represented by a narrow strip of chitin. Basistyles bulbous, pubescent, wide and short dorsally, then produced laterad but scarcely extending to end of aedeagus, joined ventrally by a narrow strip of chitin, bearing in a large apical notch the single dististyle which is stout and thick basally (fig. 94, d), then bent and tapering, apex abruptly narrowed to short,

wide, chitinised tip, inner basal angle acute; aedeagus a large flattened structure (fig. 94, *c*), rounded apically and armed with two chitinised, dorsally curved, acute hooks; basal region prolonged into two slender membranous "latera"; penis undetectable.

Alexander listed the holotype as a male, stressing, however, that "from the genitalia of the dried specimen it does not seem to be a male." An examination of the holotype's genitalia, after treatment in alcohol and KOH, and also those of freshly caught specimens, revealed that the above male hypopygium is not typical of the genus *Erioptera*.

Ovipositor (fig. 94, *g, h*) not composed of acicular valves but reduced in size and chitinisation. Dorsal valves short, fleshy, pubescent, rounded apically and contiguous medially, longer than the sternal valves but slightly longer than ninth tergite; sternal valves wide basally, tapering to acute apices which are separated by a narrow U-shaped notch; dorsad to these latter valves and lying within their concave surface is a lobelet on either side, subequal in length. Attached to the lateral margin of eighth sclerite is a large pubescent flattened blade, rounded apically (viewed laterally), but which appears as a narrow curved rod when viewed dorsally, being shorter than the tergal valves.

Localities.—Cape Peninsula: Orange Kloof (C. W. T.), November 1931; Fernwood (C. W. T.), November 1933.

Cape Province: Matroosberg (Lightfoot), January 1917; French Hoek Pass (G. A. W., H. G. W.), December 1932 and 1933; January 1935; Palmiet River (G. A. W., H. G. W.), January 1937.

Larva.—Length 9 mm., diameter .4 mm. Colour dirty yellow; integument thin, revealing the underlying muscle fibres and the dark brown contents of the alimentary canal.

Form slender, terete, constricted prior to spiracular disc. Chaetotaxy consists of long irregularly scattered hairs. Creeping welts absent.

Spiracular disc (fig. 95, *a*) small, lying within the deep concavity of the four slender, whitish lobes which surround it; ventral lobes much elongated, three and a half times the length of the dorsal lobes, outer margin fringed with delicate whitish hairs which at the apex of the lobe become twice as long as the basal hairs, laterad and cephalad of disc a long stiff seta.

Head capsule long, slender, consisting of three concave plates, one dorsal and two lateral, the margins of which are heavily chitinised.

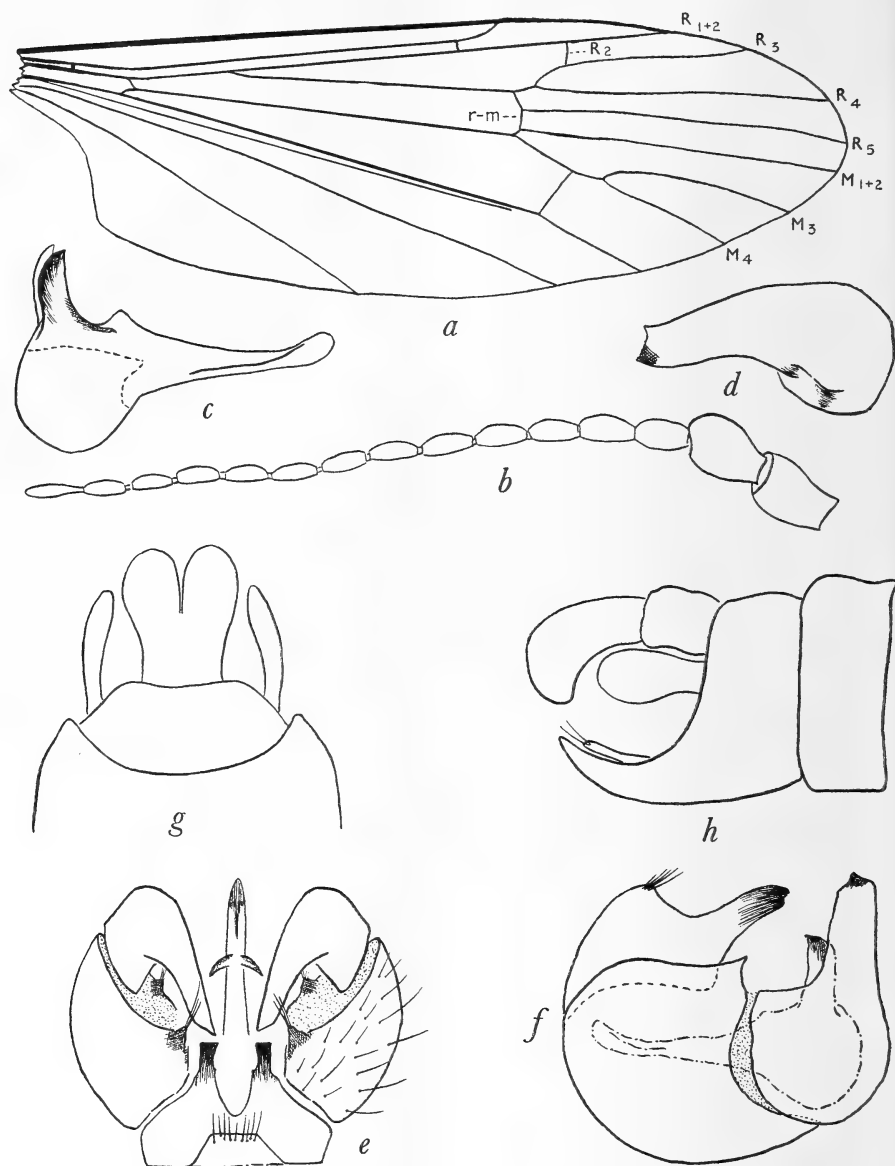


FIG. 94.—*Erioptera claripennis* Alex. *a*, wing; *b*, antenna; *c*, aedeagus; *d*, dististyle; *e*, *f*, male hypopygium (dorsal and lateral views); *g*, *h*, female ovipositor (dorsal and lateral views).

Labrum and maxilla as in the genus *Gonomyia*. Remainder of head capsule difficult to distinguish and cannot be accurately described until additional material is available for examination.

Pupa.—Length 6–6.5 mm., diameter .5–.6 mm. Colour light to dark orange-yellow, eyes black, mature pupae have dark brown to black wing pads.

Cephalic crest absent. Antenna (fig. 95, *d*) moderately long, extending to base of wing pad, margins smooth, constricted suddenly to slender apex. Labrum (fig. 95, *c*) short, as broad as long, apex bluntly rounded; labial lobes (fig. 95, *c*) prominent, truncate and fused medially, each outer angle somewhat produced and bluntly rounded; maxillary palpi (fig. 95, *c*) short, straight, directed backwards and lying along the cheek (fig. 95, *b*), wide at origin, tapering to narrow, pointed apices.

Thoracic pronotum depressed on either side of median carina, armed with a stiff seta dorsad of origin of each antennal sheath. Breathing horns absent; no indication of a pore even can be detected under high magnification. Mesonotum convex, smooth, with a slight median carina along one-fifth of its length; armed with a short seta mesally. Wing pads terminate opposite end of posterior annulus of segment 2 (fig. 95, *b*); leg sheaths equal in length, ending opposite anterior annulus of segment 3.

Abdomen considerably flattened dorso-ventrally, segments 2–7 subdivided into two annuli, anterior annulus longer than posterior and again subdivided into three ridged transverse annulets; pleural margins slightly carinate. Chaetotaxy restricted to four to six minute dorsal setae along posterior margin of segments.

♂ cauda (fig. 95, *e, f*): Sternal sheaths wide, stout, bulbous, closely placed, contiguous medially; tergal sheaths slightly shorter, caudal margin of each widely bifid, the inner bifurcation a minute, conical, spinelike lobe, outer bifurcation large, prominent, directed dorso-caudally and produced as a well-chitinised acute lobe; on the slightly raised mesal surface of eighth segment occur two small rounded protuberances, each armed with a solitary seta.

♀ cauda similar to that of male, no distinct external feature can be given to differentiate the sexes of the pupae of this species; dissection of the genitalia of the imago from the cauda of the pupa will alone decide the sex of the pupa under examination.

Remarks.—In the swift flowing upper reaches of the River Zonder End Mrs. Wood and the author discovered the pupal “shucks” of this species flattened against the small boulders on the edge of a pool

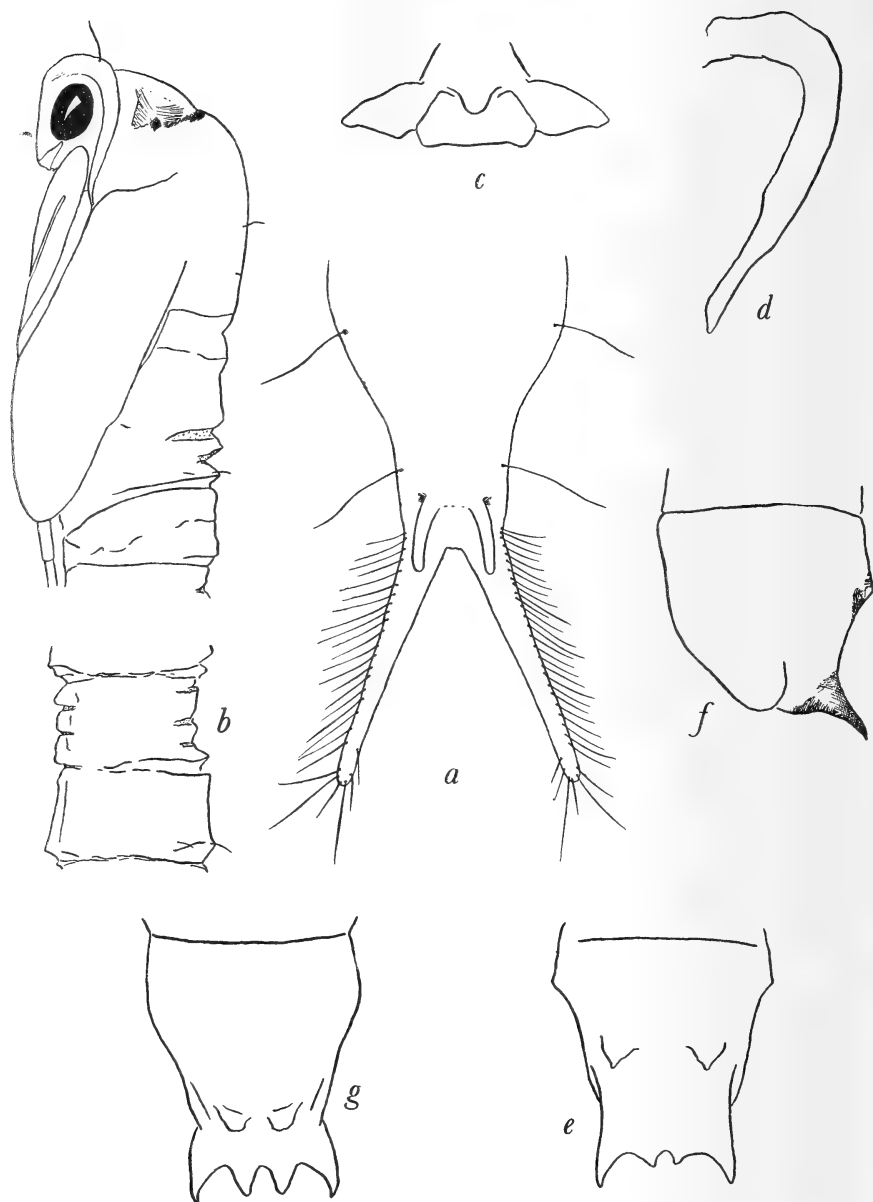


FIG. 95.—*Erioptera claripennis* Alex. Larva: *a*, spiracular lobes. Pupa: *b*, anterior portion; *c*, mouth parts; *d*, antennal sheath; *e*, *f*, cauda (dorsal and lateral views). *Erioptera witzenbergi* sp.n. *g*, cauda of pupa (dorsal view).

one foot deep and some six feet in diameter (December 1933). Several adult flies were captured by sweeping the foliage of tree-heath bounding the margins of the stream. During December of the next year Mrs. Wood and the author found forty to fifty pupae and three larvae of this species in the same pool. The larvae and the majority of the pupae died within three days after being placed in breeding phials in spite of every attempt by the author to imitate the aeration present in the splashing sunlit stream.

Erioptera bonae spei Alex.

Fig. 96.

1917. pp. 148-149, pl. x, fig. 11 (wing).

Length 3-3.1 mm., wing 3.9-4 mm. General coloration light brownish grey.

Antennae (fig. 96, *b*) 16-jointed: scapal joint 1 short-cylindrical; scapal joint 2 conspicuously larger and swollen, twice as long as broad; flagellar joint 1 globular, as broad as long, one-half the length of scapal joint 2; flagellar joint 2 similar to flagellar joint 1 in shape but only two-thirds of its length; joint 3 slightly longer than broad, subglobular, barely longer than joint 2; joints 4-6 short-fusiform, becoming twice as long as broad; joints 7-9 longer in length, three times as long as broad; joints 10-13 elongate-fusiform, five and a half times as long as broad; ultimate joint four times as long as broad, being two-thirds of the penultimate joint, rounded apically.

Wings (fig. 96, *a*) as described and figured by Alexander. Sc short, ending opposite one-third the length of RS, Sc₂ removed from tip of Sc₁ by a distance equal to r-m vein; RS short, three to three and a half times m-cu vein, slightly curved, cell R₃ one and a half times of its petiole, widely divergent at wing margin, being two and a quarter times the width of cell R₄; R₂ branches from an element R₂₊₃₊₄, hence vein R₃₊₄ is present (compare *Erioptera longicalcaratus*), cell M₃ two and a half times its petiole, becoming increasingly divergent to wing margin; 1st M₂ open by atrophy of m; vein m-cu inserted at fork of M; veins 1A and 2A practically straight.

Male hypopygium (fig. 96, *c*): ninth tergite roughly oval, bearing a basal transverse row of eight stiff setae, caudal margin prolonged into a membranous trilobed plate reaching almost to apex of penis, clothed with short delicate pubescence mesally. Basistyles longer than broad,

pubescent, tapering slightly towards apex, inner apical angle prolonged into a short pubescent lobe, rounded apically, each basistyle bearing two dististyles joined basally by a narrow strip of chitin, dorsal dististyle (fig. 96, *d*) a slender, cylindrical, fleshy rod curved dorsad,

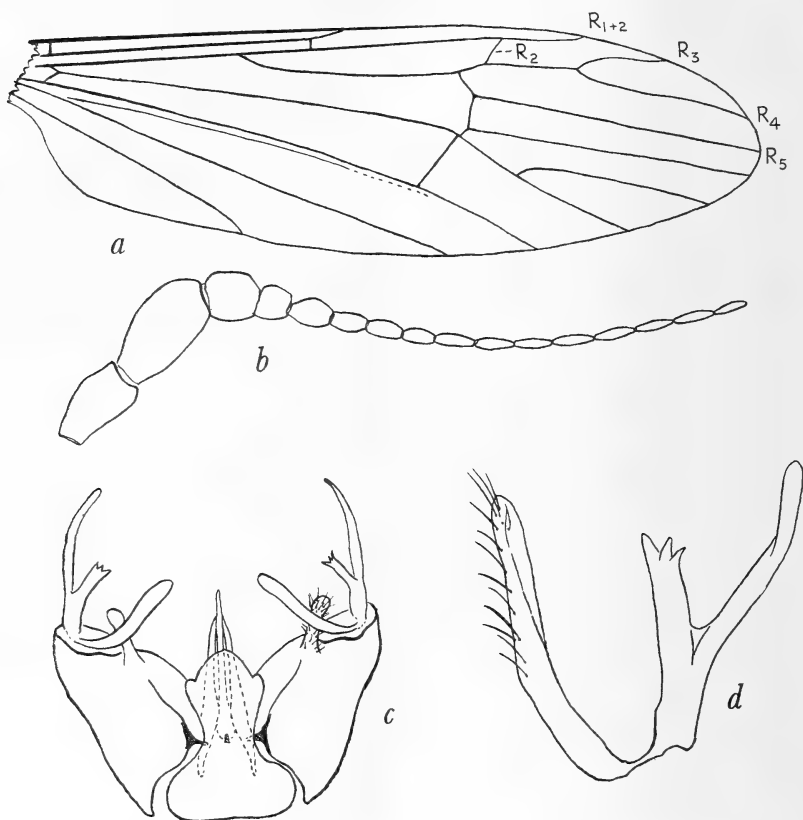


FIG. 96.—*Erioptera bonae spei* Alex. *a*, wing; *b*, antenna; *c*, male hypopygium (dorsal view); *d*, dististyles.

ventral dististyle (fig. 96, *d*) divided at mid-length into two processes, the dorsal a flat chitinised blade, apex of which is split into three short, curved hooks, the dorsal hook the largest, ventral process an elongate, slender, tapering, slightly curved rod, apex rounded. Ninth sternite apparently absent as the basistyles are fused ventrally. Aedeagal sheath (fig. 96, *c*) supported by two chitinous strips attached to the inner basal margin of basistyles, tapering and surrounding the bulbous portion of penis basally, produced cephalad into two stout,

wide, platelike "latera"; penis slender, projecting from the aedeagal sheath, apex acute.

Localities.—Cape Peninsula: Cape Town (Lightfoot), August 1909; Orangezicht (K. H. B.), August 1933.

Cape Province: du Toits Kloof (West side) (G. A. W., C. W. T., H. G. W.), May 1934.

Erioptera longicalcaratus sp.n.

Fig. 97.

Length 4-4.5 mm., wing 5-5.5 mm. Rostrum of head short, stout, less than length of head, pale yellow; palpi short, as long as head itself; vertex of head dark brown; eyes black. Antennae (fig. 97, *b*) pale yellowish brown, 15-jointed; scapal joint 1 short-cylindrical, twice as long as broad; scapal joint 2 wider, as broad as long; flagellar joint 1 subglobular, almost twice as long as broad; joints 2-7 fusiform but equal in length to joint 1, three times as long as broad; remainder of flagellum having joints longer, four times as long as broad; ultimate joint rounded apically.

Mesonotal praescutum dark brown, scutellum and postnotum lighter in colour, yellowish brown. Pleura yellowish brown. Halteres dirty white. Legs yellowish brown. Wings (fig. 97, *a*) tinged with pale brown, stigma indistinct, venation similar to that of *E. clari-pennis*; Sc long, terminating at four-fifths of the length of RS; Sc₂ removed from tip of Sc₁ by a distance equal to three times R₂₊₃₊₄, Sc₁ terminating beyond fork of R₂₊₃₊₄, practically at R₂; R₂ branches from an element R₂₊₃, hence R₃₊₄ is absent (compare *E. bonae spei*); RS long and straight, six times m-cu; cell 1st M₂ open by atrophy of m, cell M₃ five times its petiole, becoming increasingly divergent as vein M₄ is straight; m-cu inserted at mid-length of M₃₊₄; veins 1A and 2A straight.

Abdomen light brown, hypopygium lightish yellow. Ninth tergite triangular, apex posterior and prolonged into a widely rounded plate, caudal margin of which is indent medially, producing two rounded lobelets. Basistyles (fig. 97, *c*) short, as wide as long, tapering suddenly to narrow apex, inner apical angle prolonged into a strong, conspicuous, chitinated rod, as long as the basistyle and longer than the actual dististyle, resembling at first glance a dorsal dististyle, only one dististyle articulates in notch of each basistyle (fig. 97, *c*, *d*),

being narrow basally, then dilated and divided into two portions, the dorsal abruptly narrowed to a bluntly rounded chitinised apex, the ventral portion more fleshy, three to four times as long as dorsal

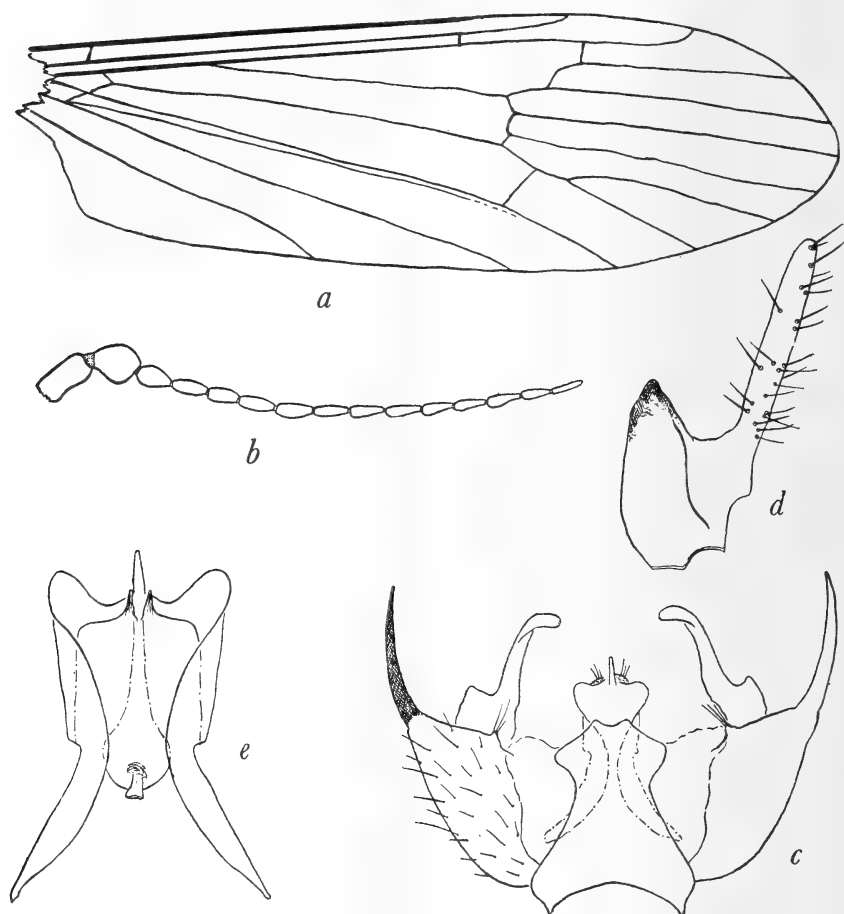


FIG. 97.—*Erioptera longicalcaratus* sp.n. a, wing; b, antenna; c, male hypopygium (dorsal view); d, dististyle; e, aedeagal sheath and penis (dorsal view).

portion, pubescent, a hooklike rod, apex rounded; ninth sternite elongate-triangular, pubescent, forming a hollow, dorsally-directed, keel-shaped structure into which nestles the aedeagal sheath, basistyles not fused ventrally. Aedeagal sheath (fig. 97, e) short, one and a half times as long as broad, surrounding the penis, caudal margin produced into two membranous rounded lobes; penis short, slender.

Female similar in general appearance to male, but slightly darker in colour. Ovipositor not composed of acicular valves but reduced in size and chitination. Dorsal valves short, fleshy, pubescent, rounded apically and similar in shape to those of *E. claripennis* (see fig. 94, *g, h*).

Localities.—Cape Peninsula: Silvermine Valley (H. G. W.), March 1933; Orange Kloof (H. G. W.), March 1933; (C. W. T.) November 1934.

Cape Province: du Toits Kloof (West side) (H. G. W.), May 1934; Oudebosch (C. W. T., H. G. W.), September 1934; (K. H. B.) January 1934; Sneeuwgat (K. H. B., C. W. T., H. G. W.), November 1932.

Erioptera witzenbergi sp.n.

Figs. 95, *g*; 98.

Length 3.5–3.8 mm., wing 4.4–2 mm. Rostrum short, less than head in length, light brown; palpi short, light brown; head dark brown; eyes black. Antennae (fig. 98, *b*) dark brown, 15-jointed; scapal joint 1 cylindrical, three times as long as broad; scapal joint 2 shorter, slightly longer than broad, subglobular; flagellar joints 1–2 equal to previous joint in length, short-fusiform, twice as long as broad; flagellar joint 3 slightly shorter than joint 2, but still twice as long as broad; joints 4–8 short-fusiform, of equal length, two and a half times as long as broad; joints 9–13 fusiform, scarcely shorter in length but distinctly narrower, being three times as long as broad; ultimate joint rounded apically, slightly longer than penultimate joint.

Thorax unicolorous, dark blackish brown, pleura paler, light brown. Wings (fig. 98, *a*) suffused with yellowish brown, veins dark brown, stigma indistinct; Sc long, terminating before fork of RS by a length equal to m-cu; Sc₂ removed from tip of Sc₁ by distance equal to m-cu; Sc₁ terminating practically opposite fork of RS; R₂ branches from an element R₂₊₃, hence element R₃₊₄ is absent; RS long and straight, five times m-cu; R₃ almost parallel to R₁₊₂, thus cell R₃ not divergent, fifteen times its petiole, cell 1st M₂ open by the atrophy of m, cell M₃ five times its petiole, becoming increasingly divergent, m-cu inserted at mid-length of M₃₊₄, veins 1A and 2A straight.

Abdomen dark brown. Male hypopygium with ninth tergite

elongate-triangular, narrowed suddenly into a short, slender, chitinised, acute apex, curved slightly dorsad; beneath this apical portion and prolonged past it, to overlie the aedeagal sheath, occur

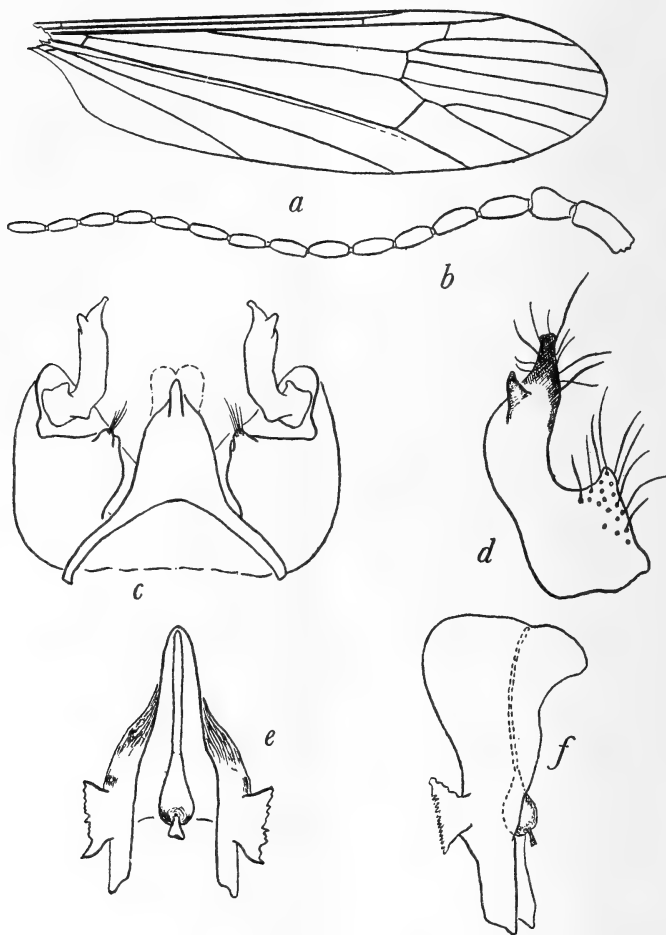


FIG. 98.—*Erioptera witzenbergi* sp.n. a, wing; b, antenna; c, male hypopygium (dorsal view); d, dististyle; e, f, aedeagus (dorsal and lateral views).

two closely placed, transparent, rounded, membranous lobes. Basistyles (fig. 98, c) longer than broad, inner apical angle prolonged into a small rounded lobe bearing several stiff setae, outer apical angle slightly produced, subacute; only one dististyle (fig. 98, c, d) articulates in apical notch of each basistyle, being a flattened chitinised blade,

wide basally, then divided into two processes, the ventral produced into a small, rounded, pubescent lobe, the dorsal process elongate, conspicuous, heavily chitinised, constricted apically to a truncate pubescent hook, the ventral angle prior to the constriction bearing a small acute tooth. Ninth sternite apparently absent, bases of basistyles closely approaching one another, joined by a narrow strip of chitin. Aedeagal sheath (viewed laterally, fig. 98, *f*) a deep flattened structure surrounding the penis, ventral margin widely rounded, dorsal margin prolonged into a dorsally curved subacute apex (viewed dorsally, fig. 98, *e*), the sheath is widely rounded basally, the "latera" being produced cephalad into narrow chitinised plates to which are attached membranous strips for the attachment of the sheath to the inner basal portions of the basistyles; penis short, bulbous basally, tip not projecting from the aedeagal sheath.

Ovipositor not composed of acicular valves but reduced in size and chitinisation; similar to that of *E. claripennis* (see fig. 94, *g*, *h*).

Localities.—Cape Peninsula: nil.

Cape Province: Skurftbergen and Witzenbergen
(C. W. T.), October 1937.

Pupa.—See p. 288 and fig. 95, *g*.

Erioptera peringueyi Bergroth.

Fig. 99.

1888. pp. 129–130.

1917. Alexander, p. 149, pl. x, fig. 12 (wing).

1921. *Id.*, p. 191.

Length 6·9–7 mm., wing 5·8–7·5 mm. General coloration light brownish black.

Antennae (fig. 99, *b*) 16-jointed; scapal joint 1 short-cylindrical, twice as long as broad; scapal joint 2 shorter, one and a half times as long as broad, subglobular; flagellar joints 1–2 becoming shorter but as long as broad, semi-globular; joints 3–6 short-fusiform, one and a half times as long as broad; joints 7–9 longer, twice as long as broad; joints 10–14 elongate-fusiform, three times as long as broad; ultimate joint one-half the penultimate, rounded apically.

Wings (fig. 99, *a*) light yellowish brown, clouded with two darker transverse bands, one across the origin of RS, the other from the stigma along the forking of RS and M; venation with Sc short,

ending beyond origin of RS by a distance subequal to R_{2+3+4} ; Sc_1 elongate, at least three to three and a quarter times the length of R_{2+3+4} , terminating opposite fork of R_{2+3+4} ; R_2 branches from an element R_{2+3} , hence element R_{3+4} is absent; RS long, almost straight, three and a half times its petiole, cell 1st M_2 open by atrophy of m,

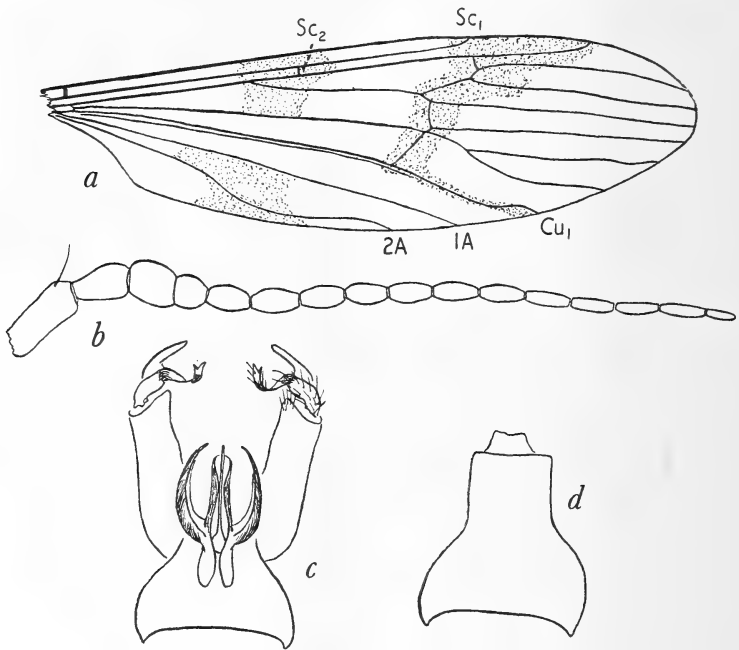


FIG. 99.—*Erioptera peringueyi* Bergroth. *a*, wing; *b*, antenna; *c*, male hypopygium (dorsal view), with ninth tergite removed; *d*, ninth tergite (dorsal view).

cell M_3 three and a half times its petiole, slightly divergent, veins M_3 and M_4 swing cephalad near wing margin, m-cu inserted prior to fork of M by distance equal to r-m, Cu_1 sinuous near tip, vein 2A sinuous, closely approaching wing margin at mid-length and thus providing a ready specific distinction.

Male hypopygium (fig. 99, *c*, *d*) with ninth tergite prolonged caudad into a membranous truncate lobe concealing the aedeagal structure and penis. Basistyles long, twice as long as broad, prominent, pubescent, bearing two dististyles apically, the dorsal dististyle a flattened blade, wide basally, then suddenly constricted and bent at mid-length into a narrow bifid apex; ventral dististyle a pubescent

rod, wide basally, constricted at mid-length and generally tapering gradually to a bluntly rounded apex. Ninth sternite present, a narrow structure connecting the bases of the basistyles, caudal margin pubescent. Aedeagal sheath wide basally, produced caudally into two slender chitinated apices and bearing basally two slender, dorsally directed, acute appendages; penis short, curved ventrad apically, actual apex bifid.

Ovipositor of normal construction and chitination, tergal valves elongate, curved strongly dorsad, sternal valves shorter, wide basally, tapering to slender acute apices.

Localities.—Cape Peninsula: Camps Bay slopes (H. G. W.), September 1932.

Cape Province: Stellenbosch (Peringuey), November 1887; Palmiet River (G. A. W., H. G. W.), January 1937.

Also Natal (Alexander, 1921).

Remarks.—This crane-fly is readily distinguished by the two transverse bands of colour across the wing and by the sinuous 2A vein.

Erioptera ignava Alex.

1920*b*. pp. 30–31.

Length 5·8–6 mm., wing 5·7–6·2 mm. No additional specimens have been recorded since the holotype was described by Alexander; this species is readily distinguished from other species of *Erioptera* in the S.W. Cape by the features listed in the key.

Localities.—Cape Peninsula: Cape Town, September 7 (no year, no collector's name given).

Erioptera clausa Alex.

Fig. 100, *a-d*.

1921. pp. 190–191.

Length 1·8–2 mm., wing 3 mm. General coloration yellowish brown.

Antennae (fig. 100, *b*) 15-jointed, clothed with coarse pubescence and moderately long verticils; scapal joint 1 short-cylindrical, one and a half times as long as broad; scapal joint 2 large, conspicuous,

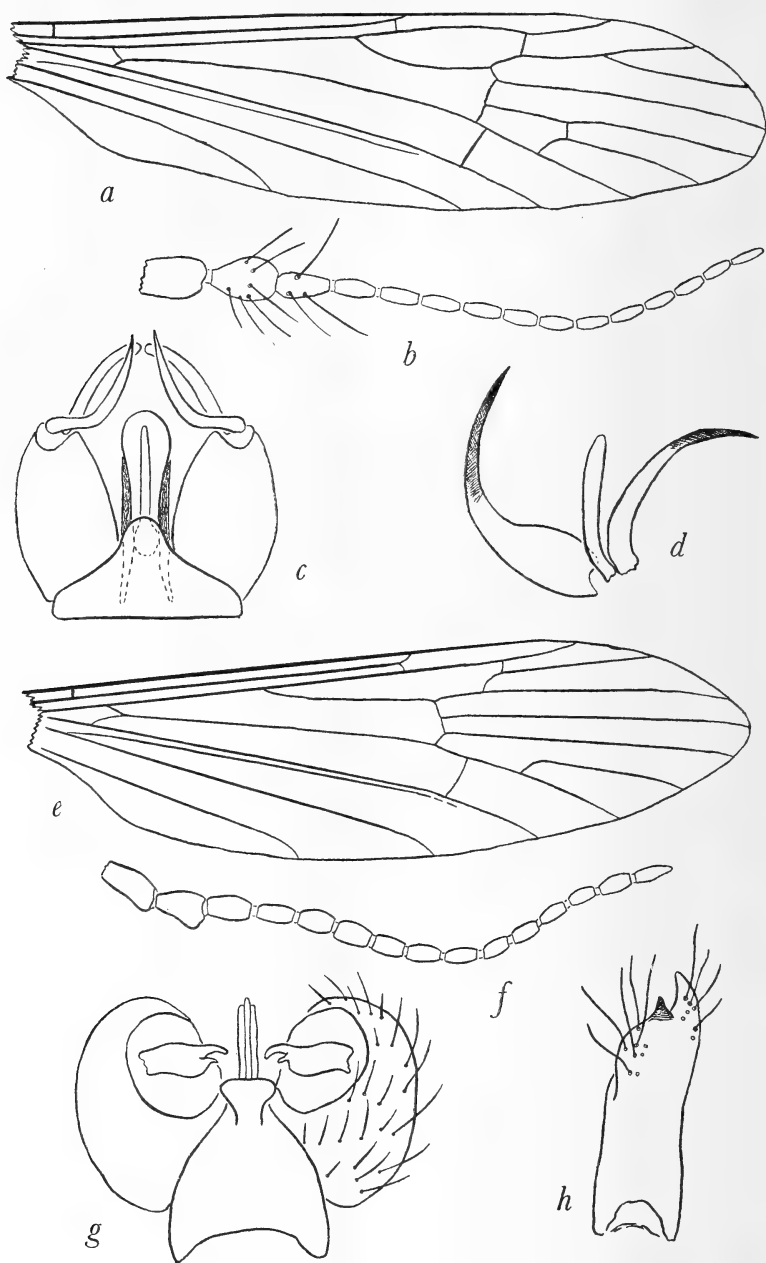


FIG. 100.—*Erioptera clausa*, Alex. a, wing; b, antenna; c, male hypopygium (dorsal view); d, dististyles (male hypopygium). *Erioptera brumatus* sp.n. e, wing; f, antenna; g, male hypopygium (dorsal view); h, dististyle.

equal to previous joint in length, subglobular; flagellar joint 1 oval, twice as long as broad, as long as previous joint; flagellar joints 2-12 oval, gradually becoming shorter and narrower but remaining twice as long as broad; ultimate joint fusiform.

Wings (fig. 100, *a*) as described by Alexander. Sc short, ending opposite one-quarter the length of RS; Sc₂ almost at tip of Sc₁ and subequal to it; RS short, two and a half times m-cu, strikingly curved, continued into R₂₊₃₊₄ so that these two veins form a wide semicircle, cell R₃ slightly divergent at wing margin, being subequal to width of cell R₂ at margin, the latter cell uniformly wide; R₂ branches from an element R₂₊₃₊₄, hence vein R₃₊₄ is present; cell 1st M₂ closed, becoming slightly wider towards wing margin, m-cu inserted beyond fork of M, situated at two-fifths to one-half the length of 1st M₂; veins 1A and 2A not sinuous, 2A swung slightly caudad.

Male hypopygium (fig. 100, *c*) described but not figured by Alexander; of minute size. Ninth tergite reduced to a very narrow, membranous, transverse strip, median area prolonged into a short, widely rounded lobe. Basistyles large, twice as long as broad, each bearing three dististyles in apical notch, dorsal dististyle (fig. 100, *c*, *d*) the longest, flattened, swollen basally, suddenly tapering and strongly bent at mid-length to resemble a blade of a sharp cutlass; middle dististyle a smaller, almost straight, membranous rod; ventral dististyle uniformly slender, slightly bent, tip acute; aedeagal sheath slender, rounded apically, surrounding the penis, produced cephalad into two basal platelike "latera"; penis short, not projecting from the aedeagus, apex acute. Ninth sternite apparently absent, basistyles being fused ventrally for one-half their length.

Ovipositor of normal construction and chitinisation; tergal valves elongate, acicular, directed strongly dorsad; sternal valves shorter in length, wide basally, tapering suddenly to slender apices from mid-length.

Localities.—Cape Peninsula: nil.

Cape Province: French Hoek Pass (K. H. B.), December 1916; Skurftebergen and Witzenbergen (C. W. T.), October 1937.

Remarks.—This fly is one of the smallest species found in the S.W. Cape. Although Mr. Thorne records that they were swarming over grass clumps in a valley near the nek between the Skurftebergen and Witzenbergen, no larvae were found in the nearby streams (October 1937). The task of finding the immature stages which should be from four to six millimetres in length seems wellnigh impossible.

Erioptera brumatus sp.n.Fig. 100, *e-h*.

Length 3.4-4.2 mm., wing 2.8-3 mm. Head, palpi and antennae yellowish brown; frontal prolongation of head as long as the lateral diameter of head; eyes black.

Antennae (fig. 100, *f*) 15-jointed, clothed with fine short pubescence and odd scattered setalike hairs; scapal joint 1 cylindrical, twice as long as broad; scapal joint 2 equal in length, subglobular; flagellar joints gradually becoming shorter; joints 1-2 twice as long as broad, short-oval; joints 3-11 slightly shorter, one and three-quarters times as long as broad, short-oval; penultimate and ultimate joints longer than joint 11.

Prothorax prominent, brownish yellow. Mesonotal praescutum unicolourous, medium brownish yellow. Wings (fig. 100, *e*) hyaline, stigma absent; Sc long, terminating before fork of RS by a distance equal to $m-cu$, Sc_2 at tip of Sc_1 ; R_2 branches from an element R_{2+3} , hence R_{3+4} is absent (compare fig. 100, *a*), cell R_3 deep, four and a half times its petiole; RS straight, four times $m-cu$; cell 1st M_2 open by atrophy of m ; cell M_3 three times its petiole, becoming increasingly divergent; $m-cu$ inserted at one-third the length of M_{3+4} ; veins 1A and 2A practically straight, not markedly sinuous. Legs unicolourous, blackish brown.

Abdomen pale yellowish brown, hypopygium minute. Ninth tergite (fig. 100, *g*) broad-triangular, constricted slightly apically to form a chitinated, rounded median lobe. Basistyles short, as long as broad, apical notch large, bearing a single dististyle (fig. 100, *g, h*), consisting of a flattened pubescent blade, twice as long as broad, apex bearing two small chitinated hooks, the outer the larger; aedeagus a short, lightly chitinated tube, not projecting past the basistyles, surrounding the slender penis; "latera" short, swollen basally. Ninth sternite elongate-triangular, terminating practically opposite tip of penis.

Female similar to male in colour and appearance; older females dark blackish brown on the thorax. Ovipositor not composed of acicular valves but reduced in size and chitination; similar to that of *E. claripennis*, but the flattened blade attached to the lateral margin of eighth sclerite is absent.

Localities.—Cape Peninsula: nil.

Cape Province: Graafwater (C. W. T.), August 1938.

Genus DASYMOLOPHILUS Goetghebuer.

1920. p. 132.

Imago.—Rostrum short, not exceeding head; body and wings densely haired; antennae 16-jointed, with sub-basal row of elongate verticils, at least as long as respective joint; wings with anal angle lacking, margin practically parallel to vein 2A; Sc₁ elongate, terminating opposite insertion of R₂; Sc₂ far removed from tip of Sc₁, near origin of RS; three branches of RS attain wing margin; cell R₃ deep, vein R₃ longer than petiole of cell R₃; 1st M₂ cell open. Male hypopygium with a torsion of 180 degrees, ninth tergite thus ventral in position; a single dististyle articulates with each basistyle; phallosomic structure lies dorsad and arises from aedeagus, of varying specific shape and length.

The minute species of this genus are present in the mountainous regions of the S.W. Cape. The immature stages still await discovery.

Key to Species of Dasymolophilus.

- RS longer than R₁₊₂; cell R₂ at margin being considerably widened; R₂₊₃ and R₅ arise exactly at fork of RS, there being no element R₄₊₅; phallosomic structure a conspicuous, curved, blackened spine, as long as aedeagus . . . *eriopteroides*.
RS shorter, i.e. two-thirds the length of R₁₊₂; vein R₄₊₅ distinct and longer than either R₂ or R₂₊₃, being one and a half to twice vein R₂₊₃; phallosomic structure a depressed plate, caudal margin slightly concave, each caudo-lateral angle terminating in a slender, smooth, darkened spine *liliputanus*.

Dasymolophilus liliputanus Alex.

1934. pp. 61-62.

♂: Length 1·5 mm., wing 2·2 mm.

The holotype of this minute crane-fly is in the British Museum, so figures cannot be given in this paper to supplement the short description by Alexander.

Localities.—Cape Peninsula: nil.

Cape Province: Ceres (Turner), April 1925.

Dasymolophilus eriopteroides (Alex.).Fig. 101, *a-c*.1921. pp. 193-194, pl. iii, fig. 12 (wing) (*Molophilus*).

♂: Length 1.8 mm., wing 3.2-3.3 mm. Coloration dark brownish black; body and wings densely hairy.

Antennae (fig. 101, *b*) two and a half times the head and rostrum combined, clothed with fine pubescence and a sub-basal row of six to eight elongate, stiff, curved verticils, three times the length of their respective joint; 16-jointed, scapal joint 1 elongate-cylindrical, two and a half times as long as broad; scapal joint 2 large, as long as previous joint, elongate-clavate, twice as long as its broadest diameter; flagellar joints 1-3 one-half the length of and conspicuously narrower than scapal joint 2, twice as long as broad, oval-fusiform, joints 4-14 becoming slightly longer but more slender.

Wings (fig. 101, *a*) with anal angle lacking, the posterior margin from base to mid-length being almost straight and practically parallel to vein 2A; Sc_1 elongate, five-sixths the length of RS, terminating opposite insertion of vein R_2 ; Sc_2 far removed from tip of Sc_1 , ending opposite one-third of RS; RS long, one and a quarter times vein R_{1+2} ; R_{2+3} strongly arcuated at origin, short, twice the length of R_2 itself; R_2 meeting R_1 beyond fork of RS by a distance equal to its own length, R_4 a continuation of RS; R_{2+3} and R_5 arising exactly at fork of RS, the element R_{4+5} being absent; cell 1st M_2 open by atrophy of m; m-cu at fork of M.

Male hypopygium reveals a torsion of the ninth segment through 180 degrees, so that the ninth tergite is swung round to lie on the ventral aspect of the abdomen; ninth tergite large, twice the length of the ninth sternite, caudal margin practically truncate. Basistyles (fig. 101, *c*) with elongate dense pubescence, apical notch on ventral surface, bearing a single conspicuous dististyle, a semi-chitinous broad flattened blade, tapering from inner apical angle into a subacute tip. Phallosomic structure (*i.e.* the fused gonapophyses) lies dorsad of and arises from the mid-region of the aedeagus, being a conspicuous curved blackened spine, as long as the aedeagus. Aedeagus slender, elongate, "latera" short, small, tip of aedeagal sheath deeply cleft; penis small.

Localities.—Cape Peninsula: nil.

Cape Province: Landdrost (K. H. B.), 1917; Witte River (G. A. W., H. G. W.), October 1933; French Hoek Pass (G. A. W., H. G. W.), January 1935.

Genus *PODONEURA* Bergroth.

1888. p. 133.

Imago.—Rostrum short; antennae 16-jointed; wings marked with pattern of distinct spots; Sc moderately long, terminating opposite mid-length of RS; Sc₁ long, ending opposite fork of R₂₊₃₊₄, three times m-cu; Sc₂ far removed from tip of Sc₁, inserted opposite mid-length of RS; three branches of RS reach margin; R₂ meeting R₁ beyond fork of R₂₊₃₊₄ by distance equal to its own length; cell M₁ absent; cell 1st M₂ closed; vein 2A moderately sinuous. Male hypopygium with two dististyles on each basistyle.

The genus *Podoneura* was proposed by Bergroth for the single species found in the S.W. Cape. The immatures are still unknown.

Podoneura anthracogramma Bergroth.

Fig. 101, *d*, *e*.

1888. pp. 133–134.

1917. Alexander, p. 151, pl. x, fig. 14 (wing).

1921. *Ibid.*, p. 197.

♂: Length 4.5–4.7 mm., wing 4 mm. General coloration dark reddish brown.

Antennae 16-jointed, flagellar joints fusiform, joints 1–3 and 10–14 equal in length, middle joints somewhat longer.

Wings (fig. 101, *d*) clear, veins pale yellow; spots darker yellow, distributed as in figure; Sc₁ long, ending opposite fork of R₂₊₃₊₄, three times m-cu; Sc₂ far removed from tip of Sc₁, inserted at end of Sc, opposite mid-length of RS; RS straight, five times m-cu, about equal to vein R₃; R₂₊₃₊₄ short, arcuated, subequal to m-cu; R₂ meeting R₁ beyond fork of R₂₊₃₊₄ by a distance equal to its own length; veins R₃ and R₄ subparallel, cell R₃ deep, seven and a half times its petiole (vein R₂₊₃₊₄); cell M₁ absent; cell 1st M₂ closed, elongate, at least twice m-cu; m-cu before fork of M by a distance equal to one and a half times its own length; vein 2A strongly sinuous, closely approaching wing margin prior to its tip. Legs variegated with black.

Male hypopygium with ninth tergite narrow, slightly produced caudally into minute median indentation. Basistyles moderately long, twice as long as broad, pubescent; inner basal angle connected

to the short lateral prong of the gonapophyses. Dorsal dististyle (fig. 101, *e*) a chitinised glabrous rod, tapering gently to a biramous

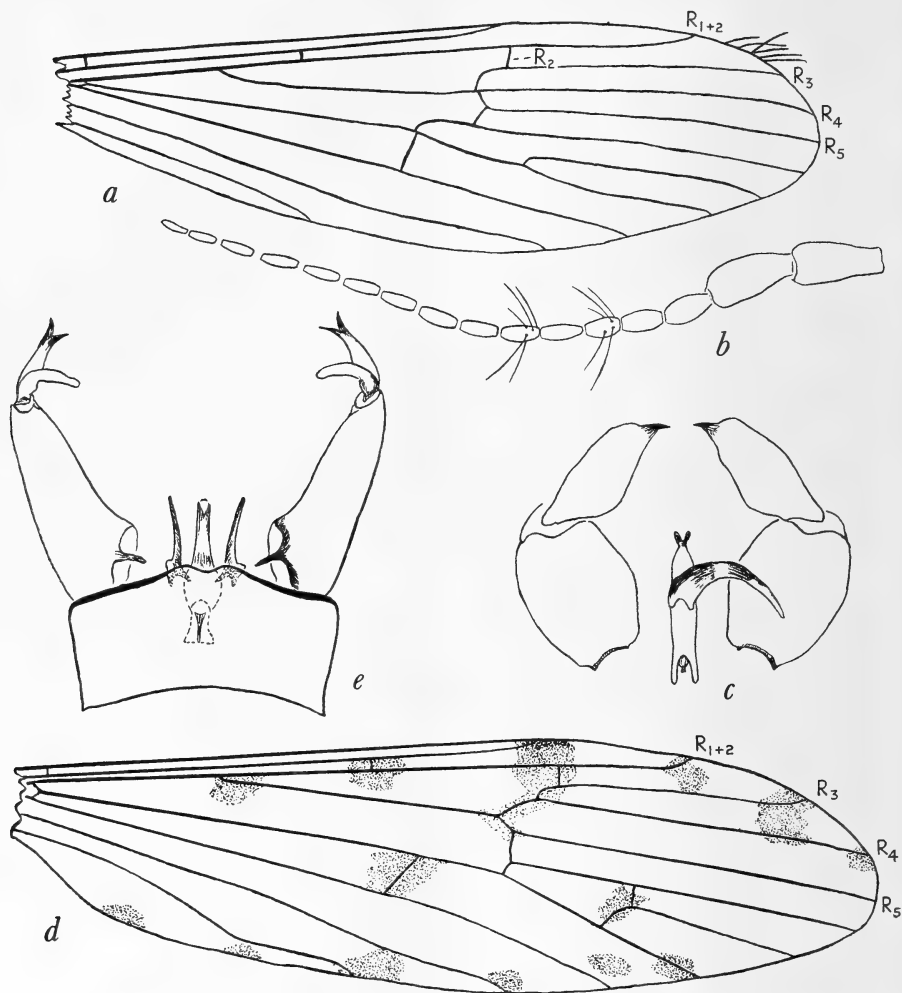


FIG. 101.—*Dasymolophilus eriopteroides* (Alex.). *a*, wing; *b*, antenna; *c*, male hypopygium, ninth tergite removed (dorsal view). *Podoneura anthracogramma* Bergroth. *d*, wing; *e*, male hypopygium (dorsal view).

apex, each prong acute and powerful; ventral dististyle (fig. 101, *e*) equal in length, somewhat less chitinised, a broader, equally strong, curved hook. Gonapophyses (fig. 101, *e*) short, each being a chitinised blade, broad basally, inner basal region connected to mid-surface of

aedeagal sheath, inner apical region prolonged into a slender, acute, slightly curved rod, outer apical region produced into short sinuous strip of chitin connected to inner angle of basistyle. Aedeagal sheath short, broad; "latera" narrow, closely surrounding the widely bulbous base of penis; apex of sheath bluntly rounded; penis slender, short.

Localities.—Cape Peninsula: Cape Town (Peringuey), November 1887; (Cowper), January 1918.

Cape Province: Steenbras (H. G. W.), January 1933.

Also Natal and Rhodesia (Alexander, 1921).

Remarks.—This fly is not common in the S.W. Cape and has not been captured alive by the author. Solitary specimens in a semi-decomposed condition have been found floating on the surface of small mountain pools.

Genus *PLATYLIMNOBIA* Alex.

1917. p. 149.

Imago.—Head large, wider than narrow thorax; terminal joint of maxillary palpi short, not whiplike; antennae 11-, 12- or 16-jointed. Front broad, widely separated eyes, which have coarse ommatidia. Mesothoracic dorsum very flattened, depressed; praescutum short, not projecting over pronotum. Halteres inconspicuous, legs slender, coxae very large, tibiae unspurred. Wings reduced to mere pads without apparent venation. Male hypopygium with stout basistyles, each bearing a *single* biramous dististyle which might at first glance appear as two separate dististyles; ovipositor with sternal valves powerful, almost straight; tergal valves more slender.

Four species of this endemic genus occur in the S.W. Cape mountains, the immature stages still await discovery. These agile wingless Tipulids are rare and seem restricted to small areas in the mountain reeds and *Restio* clumps, over which the agile males scurry backwards and forwards in their search for the females. They are distinguishable from other subapterous Crane-flies (*Tipula* and *Longurio*) by the short ultimate joint of the maxillary palpi and by the structure of the male hypopygium.

Key to Species of Platylimnobia.

- | | |
|---|-----------------|
| 1. Large size (4.5-5.3 mm.); antennae 16-jointed . . . | 3. |
| Small size (2.6-3 mm.); antennae 11- or 12-jointed . . . | 2. |
| 2. Antennae 11-jointed; ultimate joint as long as the two
previous joints combined | <i>pumila</i> . |

- Antennae 12-jointed; ultimate joint scarcely longer than previous joint *pseudopumila*.
3. Wings present, extending to base of abdomen; basistyles short, stout; penis short, not elongate, simple . . . *barnardi*.
- Wings apparently absent; basistyles longer, twice as long as broad; penis elongate, a complicated structure (fig. 102, *j*) *montana*.

Platylimnobia barnardi Alex.Fig. 102, *a-d*.

1917. pp. 150-151, text-fig. 1 (head and thorax), pl. xiii, fig. 45 (hypopygium).

♂: Length 4.6-5.3 mm., female 4.5 mm., subapterous. General coloration brownish yellow.

Antennae (fig. 102, *a*) dark brown, 16-jointed. (Alexander's statement, 1921, p. 196: "I believed that I could distinguish 16 segments, there being 14 flagellar segments," is correct.) Scapal joint 1 cylindrical, three times as long as broad; scapal joint 2 one-third the previous joint, globular; flagellar joint 1 slightly longer than previous joint, clavate, twice as long as broadest diameter; joints 2-5 equal in length to flagellar joint 1; joints 6-13 slightly shorter than joints 2-5 but equal to one another, oval-cylindrical, one and a half times as long as broad; ultimate joint two-thirds of the penultimate in length and width, rounded apically.

Wings (fig. 102, *c*) distinct, lying along thorax and extending to base of abdomen, venation nil. Legs long and slender, dark brown, of following lengths:—

	I	II	III
Femur .	6	6.2-6.4	6.5
Tibia .	6	6.2	6.2
Tarsus .	6.5	6.5	6
<hr/>			
Total .	18.5	18.9-19.1	18.7

Abdomen light brownish yellow, eighth segment dark blackish brown, hypopygium pale brown. Caudal margin of ninth tergite (fig. 102, *b*) produced slightly into two short widely triangular lobes. Basistyles stout, powerful, one and a half times as long as broad, clothed with scattered setae which become more numerous and elongated along outer apical margin. Dististyle (fig. 102, *d*) a single

biramous structure. (Alexander's statement, p. 150: "pleural appendages two," is incorrect.) Dorsal process of dististyle a well-chitinised curved hook, subacute apically, bearing on ventral mesal surface another similar hook, one-half the length and thickness of the former hook, outer margin with one or two setae; ventral process lightly chitinised, flattened, outer angle produced into a strong curved hook, inner angle into a flat triangular lobe, both angles bearing eight to ten short stiff setae. Aedeagus well chitinised, a stout broad structure surrounding the short penis; cephalad regions prolonged into short "latera," dorso-caudal regions into a slender flattened lobe extending almost to tip of penis.

Ovipositor with sternal valves powerful, almost straight; tergal valves more slender.

Localities.—Cape Peninsula: nil.

Cape Province: Landdrost (K. H. B.), January 1915
and March 1919; (C. W. T.) January 1933.

Platylimnobia pumila Alex.

1921. p. 196, pl. iv, fig. 22 (antenna).

♂: Length 2.6 mm., apterous; hind leg 2.8 mm.

The solitary holotype in poor condition, abdomen missing.

Localities.—Cape Peninsula: nil.

Cape Province: Landdrost (K. H. B.), 1917.

Platylimnobia pseudopumila sp.n.

Fig. 102, *e-g*.

♂: Length 2.6–3 mm., apterous. Head brownish yellow, broad; rostrum short, one-half the lateral diameter of head; palpi yellow, short, as long as rostrum; ultimate joint not longer than previous joint; eyes with coarse ommatidia, black. Antennae (fig. 102, *e*) light yellow, one and a half times combined head and rostrum, 12-jointed; scapal joint 1 broad-cylindrical, one and a half times as long as broad; scapal joint 2 subglobular to globular, large, as broad as long; flagellar joints one-half as narrow as scapal joint 2; joints 1–3 broad-oval, broader than long; joints 4–9 oval-cylindrical, slightly longer than broad; ultimate joint cylindrical, scarcely longer than penultimate joint.

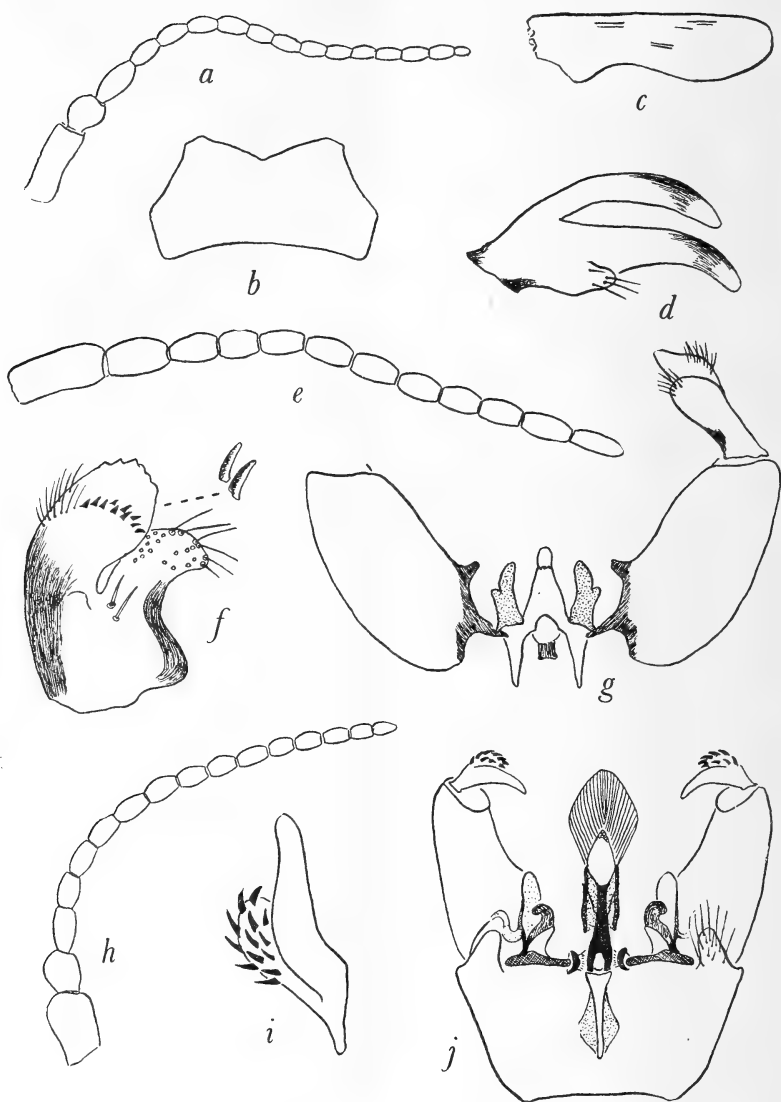


FIG. 102.—*Platylimnobia barnardi* Alex. a, antenna; b, ninth tergite; c, wing; d, dististyle. *Platylimnobia pseudopumila* sp.n. e, antenna; f, dististyles; g, male hypopygium (dorsal view), ninth tergite removed. *Platylimnobia montana* sp.n. h, antenna; i, dististyle; j, male hypopygium (dorsal view), with ninth tergite removed.

Thorax unicolourous, light brownish yellow. Wings microscopic, mere pads one-half the lateral diameter of an eye, venation nil; halteres apparently absent. Legs long and slender, dull yellow, of the following lengths:—

	I	II	III
Femur .	2.2	2.5	2.8
Tibia .	2	2.8	3.2
Tarsus .	2.6	2.6	3.2
<hr/>			
Total .	6.8	7.9	9.2

Abdomen light orange, unicolourous. Hypopygium with ninth tergite slightly produced caudad, bearing a membranous triangular lobe which partially conceals aedeagus. Basistyles (fig. 102, *g*) stout, one and a half times as long as broad, densely pubescent apically, inner basal margin heavily chitinised, dorsal angle produced into a short curved rod connected to the aedeagus by the gonapophysis. Dististyle (fig. 102, *f*) biramous, dorsal process fleshy, apex broadly rounded, bearing numerous stiff setae; ventral process the larger, heavily chitinised, produced into a swollen rounded apex, inner apical surface having a low ridge of ten to fifteen acute microscopic teeth and six to ten stiff setae. Aedeagus (fig. 102, *g*) a short tube surrounding penis, the latero-basal angles produced cephalad into broad flat “latera” and bearing a short gonapophysis on either side, this structure wide basally and connecting the “latera” to the curved rod of basistyles, prolonged into a bluntly rounded apex with a mesal rounded projection on dorsal surface. Penis projecting slightly from aedeagus; apex swollen, rounded.

Localities.—Cape Peninsula: nil.

Cape Province: French Hoek Pass (C. W. T.), October 1936.

Platylimnobia montana sp.n.

Fig. 102, *h-j*.

♂: Length 5.5–5.2 mm., apterous. Head brownish yellow, broad; rostrum moderately short, as long as lateral diameter of head; palpi yellow, twice the length of rostrum, ultimate joint not longer than previous joint; eyes with coarse ommatidia, black. Antennae

(fig. 102, *h*) light yellow, three times combined head and rostrum, 16-jointed; scapal joint 1 short-cylindrical, twice as long as broad; scapal joint 2 subglobular, as wide as broad; flagellar joint 1 the longest joint, slightly clavate; flagellar joints 2-13 broad-oval, one and a half times as long as broad, gradually becoming shorter and more slender; ultimate joint equal to penultimate in length, rounded apically.

Thorax, trochanters and coxae unicolourous, dark sepia brown; wings microscopic, as long as diameter of an eye, venation nil; halteres smaller than wings, stemless, mere flaps lying next to thorax. Legs long and slender, of following lengths:—

	I	II	III
Femur .	4	4.5	5
Tibia .	4	4.1-4.2	5-5.2
Tarsus .	3.8	3.9-4	5.5-6
<hr/>			
Total .	11.8	12.5-12.7	15.5-16.2

Abdomen light orange with dark brown suffusions around segments 1 and 2, eighth and ninth segments chestnut brown, basistyles light yellow. Hypopygium with ninth tergite and sternite forming a complete ring, caudal margin of tergite straight, each outer angle produced dorsad into a rounded lobe bearing numerous coarse hairs. Basistyles (fig. 102, *j*) clothed with moderately long hairs, conspicuous, powerful, twice as long as broad, swollen basally, tapering to widely rounded apical notch, which bears the single biramous dististyle. Dorsal portion of dististyle (fig. 102, *i*) a fleshy lobe tapering gradually to a bluntly rounded apex, mesal surface clothed with ten to twelve scattered setae, apical surface with twenty-five to twenty-eight closely placed shorter setae; ventral portion a rounded chitinised swelling two-thirds the length of the former process, bearing ten curved, chitinised teeth along outer margin and odd scattered teeth on dorsal surface. Aedeagus (fig. 102, *j*) with penis large, prolonged cephalad into the "basum"—a wide membranous plate, the central region of which is a short chitinised rod, dilated below base of penis, tapering to a slender apex and prolonged caudad into a slender chitinised tube, the apical region surrounded by a wider, more fleshy sheath, which supports a thin, fanlike membrane, striated longitudinally with extremely narrow strips of chitin. Laterad of bulbous base of penis, arising from the aedeagal structure, is the gonapophysis, connecting aedeagus to basistyle, this gonapophysis consisting of two processes,

the dorsal wide and prolonged caudad as a hollow semi-chitinised structure, strongly curved at apex; ventral process a flattened, wider, but more membranous rod, twice the length of previous process.

Localities.—Cape Peninsula: Isolation Valley (K. H. B., H. G. W.), January 1935.

Genus TRIMICRA Osten Sacken.

1861. p. 290.

Imago.—Rostrum short, not exceeding rest of head; antennae 16-jointed, simple in both sexes, last three joints conspicuously narrowed and shortened; wings with Sc_1 very long, terminating distad to branching of RS and exceeding one-half RS, which ends in cell R_4 ; three branches of RS reach wing margin, R_2 beyond fork of R_{2+3+4} ; cell R_2 at margin wider than cell R_3 which is deep, vein R_3 being longer than petiole of cell R_3 , this latter cell petiolate by distinct element R_{2+3+4} ; R_3 and R_4 nearly equal in length, veins extending generally parallel to one another to margin; R_5 entirely distinct from M_{1+2} , separated by r-m cross-vein, cell M_1 absent, cell 1st M_2 small, less than one-half distal section of M_{1+2} ; Cu_1 nearly straight, its distal section not swinging cephalad towards wing tip; coxae of middle and hind legs widely separated by "pot-bellied" meral portion; in male hypopygium two bulbous basistyles with two dististyles; tergal valves of female ovipositor elongate, strongly upcurved; sternal valves short, straight.

Larva.—Form slender. Spiracular disc surrounded by five lobes, lateral and ventral lobes equal, fringed apically with short recurved hairs. Anal gills prominent, bulbous, four in number. Chaetotaxy and creeping welts absent. Head capsule very dissected, consisting of six chitinised bars. Antennae two and a half times as long as broad, a solitary conical papilla conspicuous, moderately long. Mandible slender, powerful, with apical hook and four cutting teeth. Labrum densely pubescent. Hypopharynx a broad cushion covered with minute truncate flattened spines. Mentum inconspicuous.

Pupa.—Breathing horns wide basally, twisted into flattened blades. Deeply depressed areas on thorax behind each horn, median carina present. Cephalic crest represented by two small conical lobes. Eighth segment of cauda armed with five rounded lobes; tergal sheaths of male and female curved strongly dorsad; sternal sheaths in male large, bulbous; in female short, small.

This genus is represented in the S.W. Cape by a single species, the immatures of which occur in the gravelly sand-spits in or along the margins of streams and rivers.

Trimicra inconspicua (Loew).

Figs. 103-105.

1866. p. 59 (*Gnophomyia*).

1917. Alexander, p. 149, pl. x, fig. 13 (wing) (*Trimicra*).

1921. *Ibid.*, p. 194.

Length 6-8 mm., wing 6-8.2 mm. General coloration rufous brown.

Antennae (fig. 103, *h*) 16-jointed, the last three joints (whence generic name is derived) conspicuously shorter and narrower than the previous joints, the total length two-thirds that of the three combined previous joints, each joint tapering, four times as long as broadest diameter; scapal joint 1 short-cylindrical, twice as long as broad; scapal joint 2 subequal, subglobular; flagellar joint 1 equal to previous joint, stout, short-fusiform, twice as long as broad; joints 2-3 somewhat shorter than joint 1, similar in shape; joints 4-11 approximately equal in length to joint 1, but joints 5-11 flattened on outside, markedly rounded on inside, tapering and narrowed apically.

Wing venation (fig. 103, *a*) as given under generic characteristics; short delicate pubescence along veins.

Male hypopygium (fig. 103, *b*, *c*) has ninth tergite and sternite forming a ringlike segment, the caudal margin of tergite (fig. 103, *c*) produced and gently rounded, sternite (fig. 103, *b*) narrow, of uniform width. Basistyles enormous, bulbous, pubescent, well chitinised along inner margins, especially ventrally where basistyles are joined basally by a continuation of these chitinised margins; ventro-caudal lobe conspicuous, produced to a truncate apex bearing a few stiff setae, dorsad of this lobe a small conical protuberance bearing two to three shorter setae. Two dististyles articulate with each basistyle (fig. 103, *d*); dorsal dististyle a slender rod bent slightly at mid-length, apex truncate, rounded at inner angle, armed with fifteen to eighteen minute setae; ventral dististyle equal in length, a flattened blade, apex prolonged into a heavily chitinised hook, below which occurs a small acute prong. Aedeagus complicated (fig. 103, *e*), the

aedeagal sheath stout, moderately elongate, tapering to slender bifid apex, basal portion widened, containing the bulbous base of the short stout penis. Attached to dorsal surface of sheath at mid-length are two gonapophyses (fig. 103, *f*), which are produced into slender, chitinised, dorsally curved hooks; the basal portion of each gonapophysis is fused to a membranous support which connects the aedeagus to the inner basal surface of the basistyles, this support being produced caudally into a fleshy tapering lobe.

Ovipositor (fig. 103, *g*): tergal valves slender, narrow blades, directed strongly dorsad, tapering to acute apices, about twice as long as sternal valves, which are stout and straight, tapering to blunt apices.

Larva.—Length 12–12.5 mm., diameter .8–1.2 mm. Colour light yellowish white, becoming darker on abdomen due to the increase of the fine microscopic pubescence.

Body elongate, terete, slender, constricted slightly before spiracular disc and anal gills, greatest diameter about abdominal segment 4. Chaetotaxy and creeping welts absent.

Head capsule (fig. 104, *d*) retractile, long, very slender and dissected, consisting of six bars, the two dorsal bars being the margins of a membranous plate; base of each dorsal bar joined to that of dorso-lateral bar, the junction continued cephalad to articulate via a short rod with the transverse chitinised bar, laterad of which are situated the antennae; ventral bars hardly expanded, untoothed. Antenna (fig. 104, *d*) elongate-cylindrical, two and a half times as long as broad, conical apical papilla solitary, narrowly sculptured basally, auditory disc visible. Mandible (fig. 104, *a*) slender, heavily chitinised, apex produced into a pronounced acute hook, ventral cutting-edge with four flattened teeth, the outermost tooth the longest, the second subequal, slightly hooked, the last two closely placed, much smaller and slender, situated on a rounded protuberance on inner mesal surface; adjacent and also opposite to the tooth a single stiff elongate seta, inner ventral surface bears a large bunch of numerous elongate stiff setae radiating fanwise and directed ventrally on either side of hypopharynx. Maxilla of *Limonian* construction. Labrum-epipharynx (fig. 104, *d*) long, narrow, bluntly rounded, the entire structure densely covered with a pubescence of long yellow hairs. Mentum not conspicuous, reduced. Hypopharynx (fig. 104, *b*) a broad cushion, its entire surface covered by juxtaposed rows of slender truncate protuberances.

Spiracular disc (fig. 104, *c*) surrounded by five lobes, unmarked on



FIG. 103.—*Trimicra inconspicua* (Loew). *a*, wing; *b*, *c*, male hypopygium (ventral and dorsal views); *d*, dististyles (male hypopygium); *e*, aedeagus (dorsal view); *f*, gonapophysis; *g*, female ovipositor (lateral view); *h*, antenna.

inner surfaces, the dorsal lobe somewhat shorter than the remaining equal tapering lobes, the margins of which are fringed with fine long hairs, directed strongly outwards and becoming longer towards the apex of each lobe; spiracles large, circular, separated by twice the

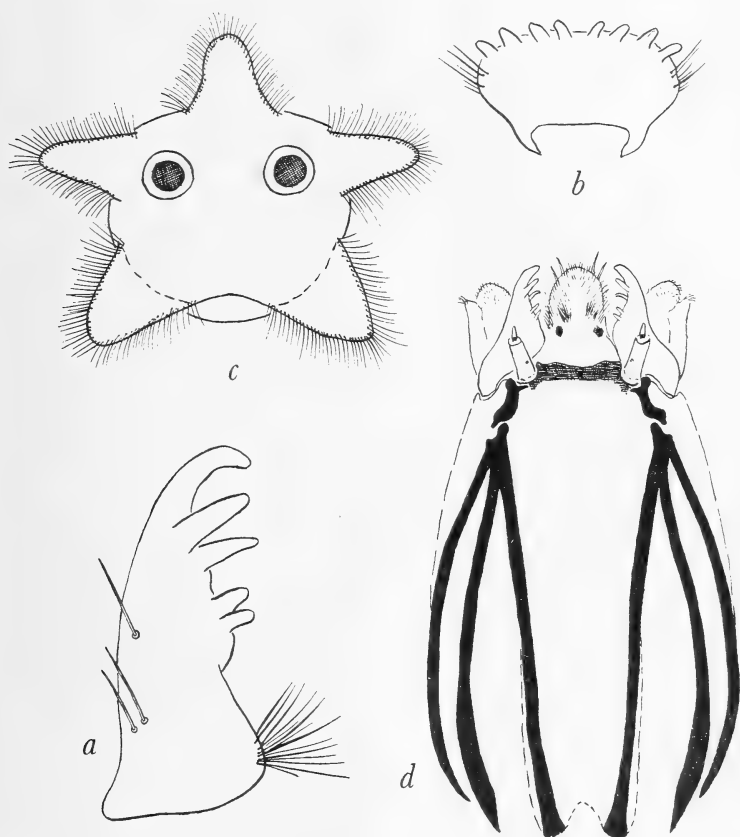


FIG. 104.—Larva of *Trimicra inconspicua* (Loew). *a*, mandible; *b*, hypopharynx; *c*, spiracular disc; *d*, head capsule (dorsal view).

diameter of a single spiracle; outer ring narrow, deep yellowish brown; inner area black, the spiracles situated at base of lateral lobes of disc. Anal gills four, equal in size, white, subglobular.

Pupa.—Length 10–11 mm., diameter .7–8 mm. Colour yellowish white, thorax dark brown, older pupae black on wing pads, leg sheaths and thorax black, horns deep yellow, eyes black.

Cephalic crest small (fig. 105, *a*) consisting of two closely placed

median conical lobes, directed ventrad, situated between bases of antennal sheaths (fig. 105, *c*), which are slender and moderately elongate, ending immediately beyond curve of wing pad, outer basal

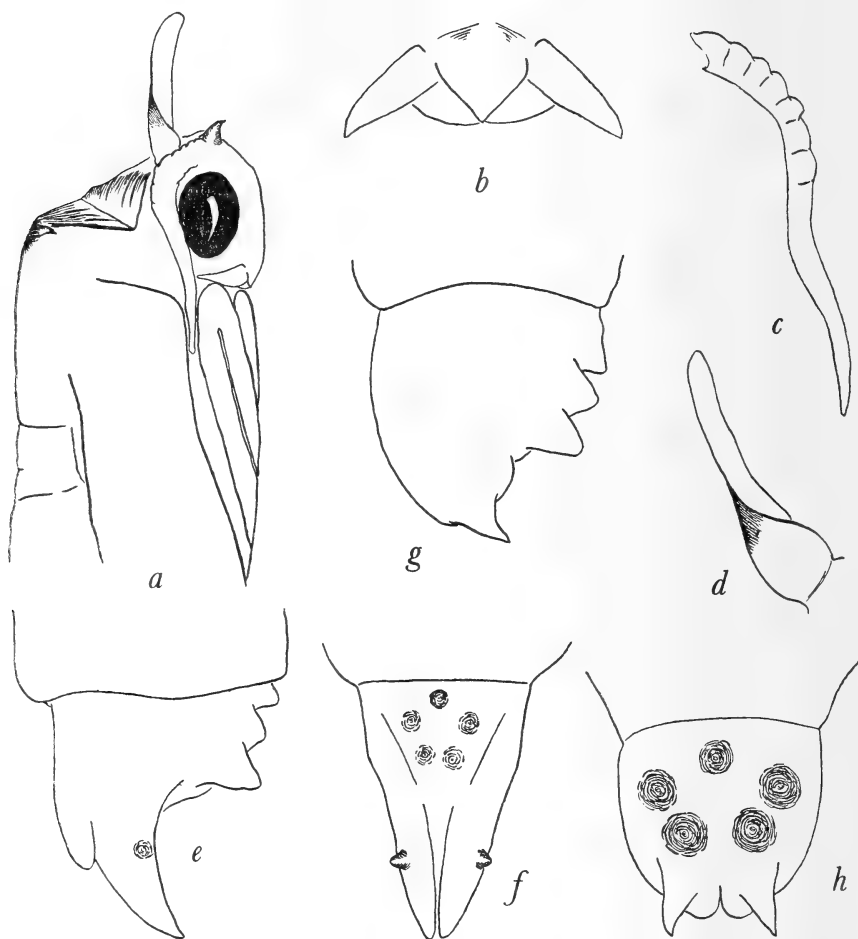


FIG. 105.—Pupa of *Trimicra inconspicua* (Loew). *a*, head and thorax (lateral view); *b*, mouth parts; *c*, antennal sheath; *d*, pronotal breathing horn; *e*, *f*, female cauda (lateral and dorsal views); *g*, *h*, male cauda (lateral and dorsal views).

margin crenulate. Labrum (fig. 105, *b*) triangular, apex posterior; labial lobes semicircular; maxillary palpi wide at origin, tapering to acute apices.

Thorax behind breathing horns deeply depressed on either side of

thin median carina (fig. 105, *a*); dorso-cephalic crest of mesonotum produced into acute conical lobelet. Pronotal breathing horns (fig. 105, *a*, *d*) moderate in size, wide basally, then twisted into flattened slender structures with slightly crenulate margins, apices slightly thickened. Wing pads terminate opposite end of abdominal segment 2; apices of leg sheaths irregular, hind tarsi terminate opposite end of segment 4, mid-tarsi at end of segment 3, fore tarsi opposite anterior annulus of segment 4.

Abdominal segments 2-7 subdivided into two subequal annuli devoid of chaetotaxy, welts or spines. Male cauda (fig. 105, *g*, *h*) armed with five prominent, closely placed lobes on eighth segment, the caudal and lateral lobes equal in size, bluntly rounded, the cephalo-median lobe small, conical; sternal sheaths very prominent, large, bulbous, rounded apically, contiguous medially; tergal sheaths smaller, tapering, well chitinised and directed dorsad, apices acute and somewhat divergent.

Female cauda (fig. 105, *e*, *f*) armed as in male, tergal sheaths conspicuous, contiguous medially, stout at origin, tapering, directed strongly dorsad; sternal sheaths shorter, rounded; lateral surface of former sheaths bearing at mid-length a small conical lobe.

Localities.—Cape Peninsula: Kasteels Poort (K. H. B., C. W. T.), October 1932.

Cape Province: French Hoek Pass (G. A. W., H. G. W.), October 1932; Meirings Poort (K. H. B., C. W. T.), October 1937; Verkerde Vlei (K. H. B., C. W. T.), October 1937; Stellenbosch (Peringuey), September 1913; Knysna (Peringuey), October 1916; Krom River (K. H. B.), September 1935.

Natal, Orange Free State, Transvaal (Alexander, *l. c.*).

Remarks.—Womersley (1937, pp. 60-63) described briefly but figured fully the immatures of the cosmopolitan *Trimicra palipes*. The larvae of *T. inconspicua* were found by Dr. Barnard and Mr. Thorne in the gravelly sand-spits under a rock shelter in a shallow portion of a wide stream (Meirings Poort, October 1937). The locality is thus similar to that recorded by Alexander (1920*a*) for American species. The pupae occurred in the drier regions of the sand-spits, the pupal stadium occupying six to nine days. Adult flies were caught near the empty pupal "shucks," which protruded from the sand.

COLLECTORS

- K. H. B. = Dr. K. H. Barnard, S. Afr. Mus.
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 R. M. Lightfoot, S. Afr. Mus. (died 1921).
 Dr. L. Peringuey, S. Afr. Mus. (died 1924).
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 C. W. T. = Mr. C. W. Thorne, S. Afr. Mus.
 R. W. E. Tucker, S. Afr. Mus. (1914-1920).
 R. E. Turner, Brit. Mus. (died 1945).
 Dr. Martin Versfeld, University, Cape Town.
 G. A. W. = Mrs. G. A. Wood.
 H. G. W. = The Author.

LOCALITIES

More precise details of the abbreviated localities are as follows:—

Cape Peninsula.

Table Mountain:

- Northern slopes: Platteklip stream and Oranjezicht (between residential area and Tafelberg road).
 Western slopes: Camps Bay slopes, Kasteels Poort, Lekkerwater.
 Southern slopes: Orange Kloof, upper reaches of Palmiet River.
 Eastern slopes: Kirstenbosch (National Botanic Gardens), Nursery Ravine, Skeleton Ravine; Window Gorge, Newlands, and Fernwood (upper reaches of Liesbeek River); Cecilia (upper reaches of Diep River).
 Summit plateaus and valleys: Kasteels Poort (top), Red Gods, Isolation Valley, Echo Valley, Wynberg Caves.
 Silvermine Valley, upper reaches of the Silvermine stream on Lakeside Plateau, Kalk Bay Mountains.
 Glencairn Valley, area around catchment reservoir, upper reaches of Glencairn stream (Elsies River).
 Chapman's Peak, western side of Peninsula, south of Hout Bay.

Cape Province.

- Avontuur road, on pass between Knysna and Edmonton (Knysna district).
 Babylons Tower, Hout or Klein River Mts., north of Hermanus.
 Bain's Kloof, Wellington Mts.
 Banhoek, Stellenbosch district.
 Barrydale, north end of Tradouw Pass.
 Bosch Kloof, Keeromberg, Worcester.
 Congo, north of Oudtshoorn, foothills of Zwartbergen Range.
 Cederbergen, Clanwilliam district.
 Cold Bokkeveld, north of Ceres.
 Coldstream, Humansdorp district.

- Coloniebos, on east of Swellendam, Langebergen Range.
du Toits Kloof, west end, streams south of the Seven Sisters or Hawequas Mts., Wellington district.
Fairy Glen, Brandwacht Mts., north of Worcester.
Fonteintjiesberg, north of Worcester.
French Hoek Pass, valley to catchment intake, near summit of pass.
French Hoek Pass, east side, headwaters of River Zonder End.
Graafwater, west of Clanwilliam.
Great Winterhoek, north of Tulbagh.
Groendal Valley and Dolley Dam, Zwartkops River, 10 miles from Uitenhage.
Groot River, Nature's Valley, southern slopes of Tsitsikama Mts., Coldstream district.
Harkerville Forest station, Knysna district.
Hermitage Kloof, on west of Swellendam, Langebergen Range.
Jonkershoek, Stellenbosch district.
Kaaimans River, 6 miles east of George.
Kaaimans Gat, near Wilderness, George district.
Kogmans Kloof, between Ashton and Montagu, western end of Langebergen Range.
Krom River, southern Cederbergen, east of Citrusdal.
Landdrost Kloof, Hottentots Holland Mts., Somerset West, eastern side, headwaters of Palmiet River and River Zonder End.
Lemoenshoek Peak, Langebergen Range, north of Heidelberg (Cape).
Matroosberg, Hex River Mts., northern slopes on Ceres side.
Meirings Poort, Zwartbergen Range, north-east of Oudtshoorn.
Meirings Poort Spitzkop, peak in same range west of the Poort.
Michell's Pass, between Wolseley and Ceres.
Montagu Pass, Outeniqua Mts., north of George.
Olifants River Mts., Citrusdal, Clanwilliam district.
Oudebosch, indigenous forest, southern slopes of River Zonder End Peak.
Palmiet River, near Kleinmond, southern Hottentots Holland Mts.
River Zonder End Peak, Zonder End Range, between Caledon and Swellendam.
Robinson Pass } Outeniqua Mts., north of Mossel Bay.
Ruiterbosch }
Schoemans Poort, foothills of Zwartbergen Range, north of Oudtshoorn.
Seven Weeks Poort, Zwartbergen Range, east of Ladismith (Cape).
Skurftbergen, east of Witsenbergen Range and north of Gydo Pass (Ceres).
Slanghoek Peak, Wellington Mts.
Sneeuwgat valley, between Great Winterhoek and Witsenbergen Range, draining into Twenty-four Rivers system.
Steenbras, plateau on east side of the Spitzkop, Hottentots Holland Mts., Grabouw district.
Tradouw Pass, Langebergen Range, east of Swellendam.
Verkerde Vlei, 10 miles west of Touws River.
Voorkoeden Farm, 12 miles east of Caledon.
Vryersberg, Langebergen Range, north of Herbertsdale.
Waaihoek Mts., Waaihoek Kloof, north-west of Worcester and south of Ceres.
Witte River, valley in Wellington Mts. near Bain's Kloof.
Witsenbergen Range, Tulbagh.

Wolvenhoek Kloof, north-east slopes of Drakenstein Mts., now part of the Berg River Forestry area, French Hoek district.
 Zebasberg, part of the Waaihoek massif, north-west of Worcester.
 Zuur Vlake, plateau above du Toits Kloof, Hawequas Mts.
 Zwartberg Pass, Zwartebergen Range, south of Prince Albert.

BIBLIOGRAPHY

- ALEXANDER, C. P. (1917). *Ann. S. Afr. Mus.*, vol. xvii, Part 2, pp. 139-180.
 — (1919). "Crane-flies of New York," Cornell Univ., Agric. Expt. Stat., Part 1, Memoir 25, pp. 771-993.
 — (1920 a). *Ibid.*, Part 2, Memoir 38, pp. 695-1133.
 — (1920 b). *Ann. Mag. Nat. Hist.*, ser. 9, vol. vi, pp. 1-44.
 — (1921). *Ann. S. Afr. Mus.*, vol. xviii, Part 2, pp. 181-234.
 — (1923). *Rev. Zoo. Afr.*, vol. xi, Part 1, pp. 1-16.
 — (1924). *Arkiv. Zool.*, vol. xvi, Part 4, No. 18, pp. 1-15.
 — (1925 a). *S. A. Journ. Nat. Hist.*, vol. v, pp. 39-48.
 — (1925 b). *Rep. Harvard Afr. Exped.*, p. 1007.
 — (1927 a). *Rec. Indian Mus.*, vol. xxix, Part 3, pp. 169-171.
 — (1927 b). *Proc. Linn. Soc. N. S. W.*, vol. lii, Part 2, pp. 42-72.
 — (1929 a). *Philippine Journ. Sc.*, vol. xl, pp. 239-271.
 — (1929 b). *Dipt. Patagonia and S. Chile, Br. Mus.*, Part 1, pp. 1-240.
 — (1930). *Proc. Linn. Soc. N. S. W.*, vol. lv, Part 3, pp. 221-230, pls. 5, 6.
 — (1931). *Archiv. Hydrobiol.*, Suppl.-Bd. 9, Band 2, pp. 135-191.
 — (1934). *Encyclop. Entom.*, Tome 7, Dipt., pp. 49-62.
 — (1945). *Proc. Roy. Ent. Soc. Lond.*, vol. xiv, Parts 7-8, pp. 96-97.
 BANGERTER, H. (1928). *Mücken-Metamorphosen*, I, Konowia, vol. vii, pp. 156-161.
 — (1929). *Ibid.*, II, vol. viii, pp. 1-7.
 — (1930). *Ibid.*, III, vol. ix, pp. 97-102.
 BARNARD, K. H. (1936). *S. Afr. Geogr. Journ.*, vol. xix, pp. 3-12.
 — (1943). *Ann. S. Afr. Mus.*, vol. xxxvi, Part 2, pp. 104-108.
 BELING, T. (1886). *Verh. z. b. Ges. Wien.*, xxxvi, pp. 171-214.
 BERGROTH, E. (1888). *Ent. Tidskrift.*, vol. ix, pp. 127-141.
 — (1913). *Ann. Mag. Nat. Hist.*, ser. 8, vol. xi, p. 580.
 COMSTOCK, J. H. (1918). *Wings of Insects*, pp. 1-430.
 CURRAN, C. H. (1934). *North American Dipt.*, pp. 28-58.
 CURTIS, J. (1825). *Brit. Entomol.*, vol. 2 (15), No. 62.
 — (1833). *Ibid.*, p. 444.
 DOLESCHALL, C. L. (1857). *Nat. Tijds. N. Ind.*, vol. xiv, p. 388.
 EDWARDS, F. W. (1912). *Trans. Linn. Soc. Lond.*, vol. xv, Part 2, pp. 195-213.
 ENDERLEIN, G. (1912). *Zool. Jahrb.*, vol. xxxii, Part 1, pp. 74-75.
 GOETGHEBUER, M. (1920). *Bull. Soc. Ent. Belg.*, vol. ii, p. 132.
 HALIDAY, A. H. (1833). *Entomol. Mag.*, vol. i, p. 154.
 KARSCH, F. A. F. (1886). *Ent. Nachr.*, vol. xii, No. 4, pp. 51-52.
 LINNAEUS, C. (1758). *Syst. Natur.*, ed. 10, p. 585.
 LOEW, H. (1866). *Berlin. Entomol. Zeitschr.*, vol. x, p. 59.
 — (1869). *Ibid.*, vol. xiii, p. 3.

- MACQUART, P. J. M. (1834). Hist. Nat. des Insect. (Suit. à Buffon), Dipt., vol. i, pp. 88-95.
- (1838). Dipt. Exotiq., vol. i, Part 1, p. 49.
- MEIGEN, J. W. (1800). Nouv. Classific. Mouches, p. 15.
- (1803). Illiger's Mag., vol. ii, p. 262.
- (1818). Syst. Besch. Zweifl. Insekt., vol. i, pp. 116-153.
- OSTEN-SACKEN, C. R. VON (1859). Proc. Acad. Nat. Sc. Philadelphia, pp. 219-223.
- (1861). *Ibid.*, p. 290.
- (1869). Monogr. Dipt. N. Amer., Part 4, pp. 127-183.
- (1880). Verh. Zool.-bor. Ges. Wien, xxix, pp. 517-522.
- RIEDEL, M. P. (1914). Voy. All. et Jeannel en Afr. Orient., Ins. Dipt., iii, pp. 71-99.
- ROGERS, J. S. (1926-31). Numerous papers, see ALEXANDER.
- (1933). "Ecological Distribution of Crane-flies of N. Florida," Ecol. Mon., vol. iii, No. 1, pp. 1-74.
- SKUSE, F. A. A. (1890). Proc. Linn. Soc. N. S. W., 2nd ser., vol. iv, Part 3, pp. 757-892.
- STEPHENS, J. F. (1829). Cat. Brit. Ins., vol. iii, p. 243.
- TILLYARD, R. J. (1919). Proc. Linn. Soc. N. S. W., vol. xlv, pp. 533-718.
- (1926). Insects of Aust. and N. Zealand, pp. 1-560.
- (1926). Tipuloidea, pp. 347-349.
- V. D. WULF, F. M. (1880). Tijd. v. Entomol., vol. xxiii, pp. 159-161.
- WALKER, F. (1848). Ins. Saunders., vol. i, Dipt., p. 444.
- WESTWOOD, J. O. (1876). Trans. Ent. Soc. Lond., p. 505.
- WIEDEMANN, C. R. W. (1821). Dipt. Exotica, vol. i, pp. 24-53.
- (1828). Aussereur. Zweifl. Ins., vol. i, pp. 46-53 and 574.

ADDENDUM

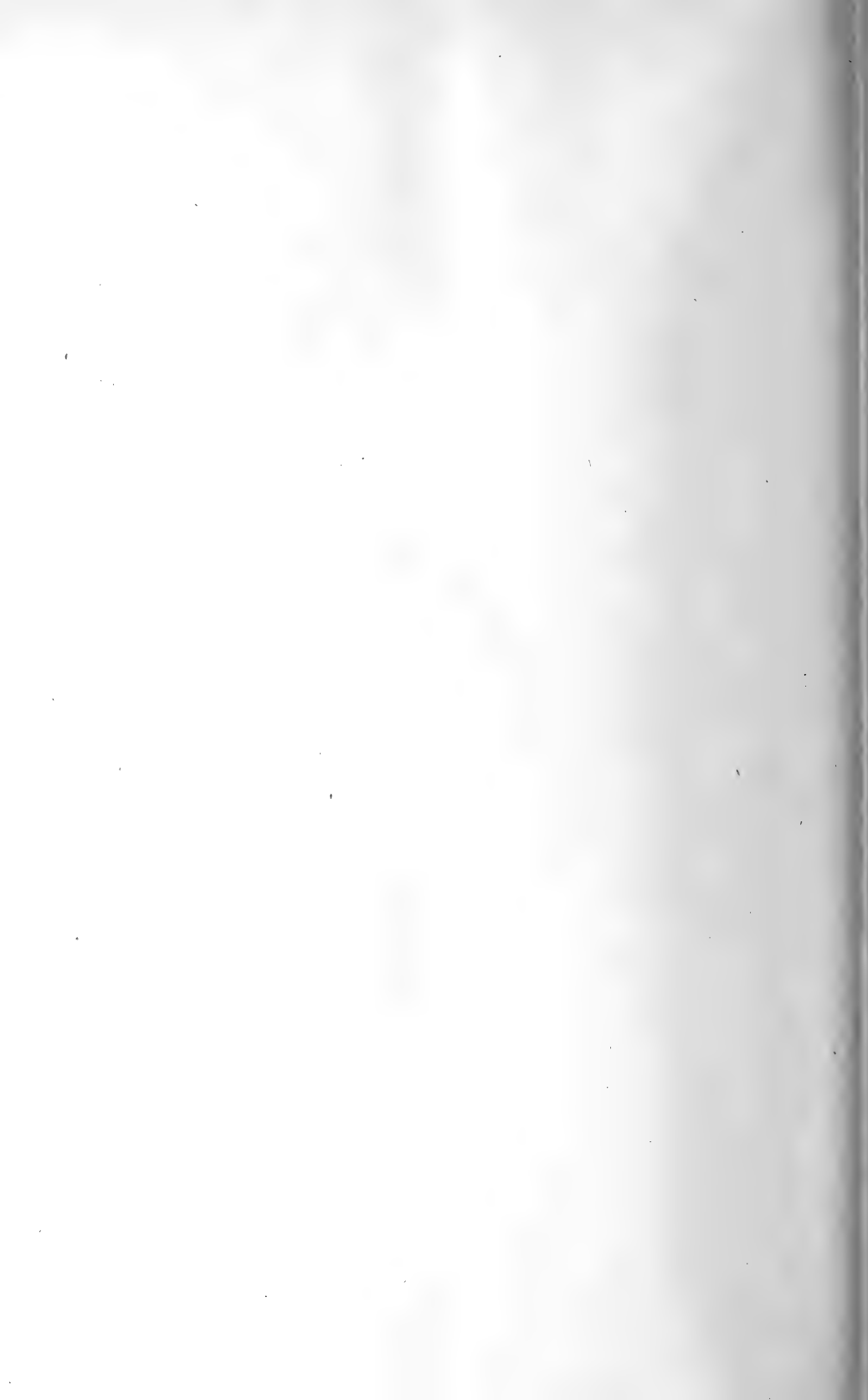
p. 193. *Antocha*.

Needham and Christenson (1927. Utah Agric. Exp. Sta. Bull. 201, p. 24, fig. 33) give figures of larva and pupa of *A. montana*, and describe method of collecting.

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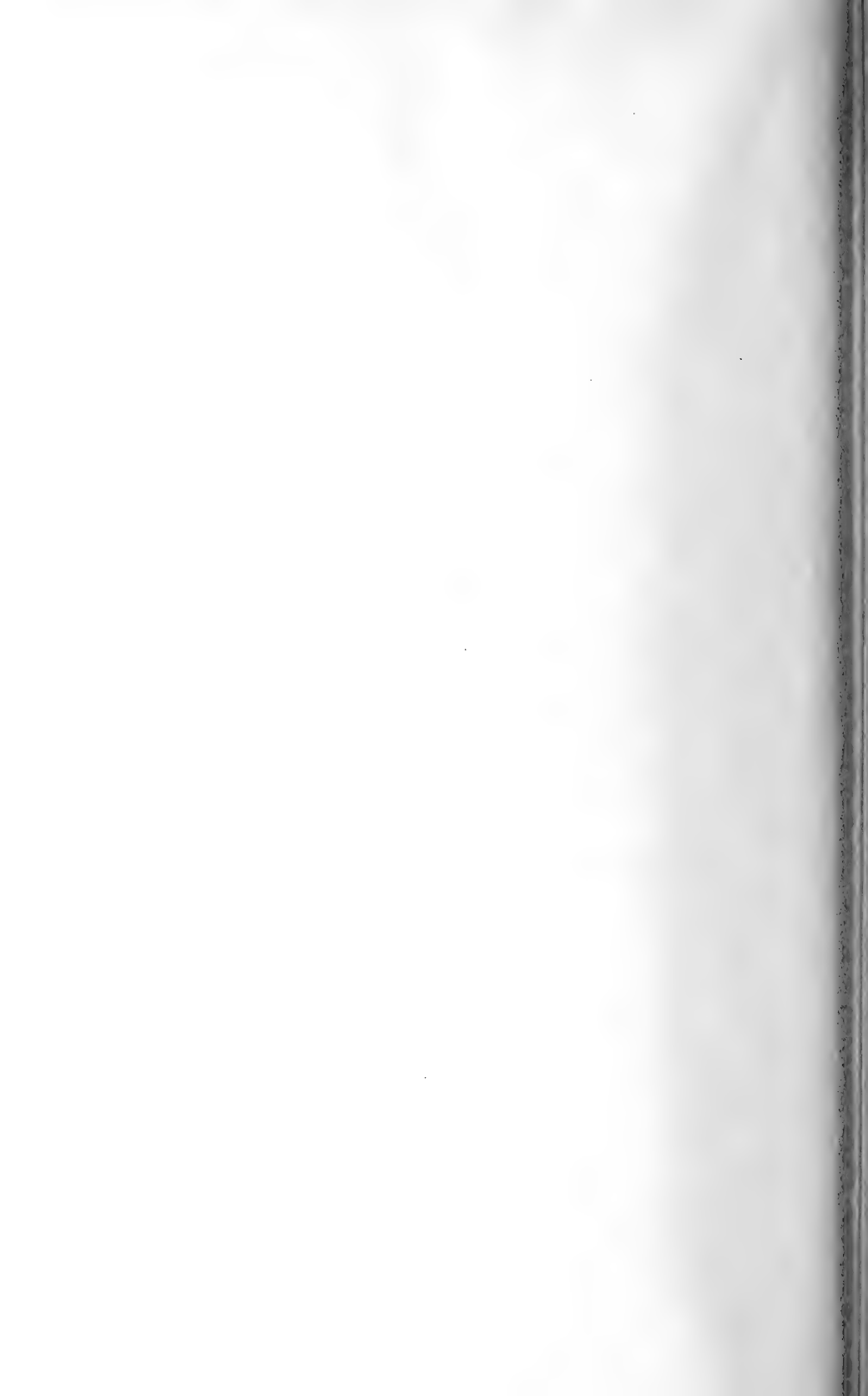
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